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PUBLIC WORKS MINISTRY.

REPORT

UPON THE

ADMINISTRATION OF THE PUBLIC WORKS DEPARTMENT IN EGYPT

FOR 1904

BY

27134

SIR WILLIAM GARSTIN, G. C. M. G.,

ADVISER TO THE MINISTRY OF PUBLIC WORKS

WITH REPORTS BY THE OFFICERS IN CHARGE OF THE SEVERAL BRANCHES
OF THE ADMINISTRATION.

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PUBLIC WORKS DEPARTMENT.

ADMINISTRATIVE REPORT FOR THE YEAR 1904.

The following pages contain my summary of the work of the Department during the year just passed. The reports which have been presented to me by the heads of the different Services concerned will be found to give full details upon all, or nearly all, the points which I myself discuss. These reports are the following :—

I.—*The Irrigation Service.*

(a) Report by Mr. A. L. Webb, C.M.G., Inspector General of Irrigation, Upper Egypt ⁽¹⁾.

(b) Report by Mr. K. E. Verschoyle, C.M.G., Inspector General of Irrigation, Lower Egypt.

II.—*Services other than Irrigation.*

(c) Report by Mr. A. H. Perry, Director General of Towns and Buildings ⁽²⁾.

(d) Report by Captain H. G. Lyons, Director General of the Survey Department ⁽³⁾.

(e) Report by Mohammed Pasha Anis, Chief of the Technical Service.

(f) Report by Monsieur G. Maspéro, Director General of the Antiquities Department.

(g) Report by Mr. G. Gunn, Inspector of Agricultural Railways.

(h) Report by Captain Stanley Flower, Director of the Government Zoological Gardens.

(1) From the 1st January 1903, Mr. Webb has been appointed Under Secretary of State for Irrigation in Egypt.

(2) From the same date, Mr. Perry has been appointed Under Secretary of State for Towns and Buildings.

(3) From the same date, the Survey Department has been transferred to the Ministry of Finance.



EXPENDITURE.

The following tables show the total sums expended in 1904, under the Budget of the Ministry of Public Works.

TABLE I.

ORDINARY BUDGET.

	L.E.	M.
Central Office	39517	872
Irrigation branch	641515	280
Towns and Buildings	220473	100
Survey Department	68538	463
Technical Service... ..	15347	997
Antiquities Department	14735	680
Total... ..	L.E. 1000128	392

This total is greater by L.E. 58226, 669 Mill. than that of the year 1903. The increase is almost entirely under the heads of Irrigation and Survey.

TABLE II.

EXTRAORDINARY BUDGET, OR WORKS EXECUTED UNDER SPECIAL CREDITS.

	L.E.	M.
Zifta Barrage (money furnished by the Caisse)	14385	734
Drainage works	29768	455
Irrigation improvements	541084	217
Nile protection (special reserve money)	8209	690
Public Buildings (Caisse money)	127437	009
Public Buildings (money found by other Departments).	11342	724
Public Buildings (special reserve)	77178	150
Total... ..	L.E. 809405	979

This total exceeds that for 1903, by L.E. 5158, 405. Rather more was spent last year upon irrigation works than in the year 1904. In addition to the above expenditure, certain further sums were devoted to works not included in Table II, the credits for which were derived from various sources. This expenditure I have, as in previous reports, grouped into a special table and entitled "Various extra credits."

TABLE III.

VARIOUS EXTRA CREDITS.

(a) *Money supplied by Caisse de la Dette.*

	L.E.	M.
Special low summer supply credit	911	082
Special low flood supply credit	13987	436
Sudd in the Rosetta branch	9998	007
Museum catalogue	2916	903
Restoration of Karnak Temples	1972	416
„ „ Edfu „	371	350
Total... ..	<u>L.E. 30157</u>	<u>194</u>

(b) *Money supplied from Revenue.*

	L.E.	M.
Revenue Survey	30387	000
Barrage Gardens (maintenance)	977	806
Cairo City „	8506	500
Provincial Towns	152	155
Ezbekieh Gardens (maintenance)	4533	740
Sudd-cutting in the Sudan,	429	366
Total... ..	<u>L.E. 45199</u>	<u>737</u>

The expenditure in these two tables is greater than that for the year 1903, by L.E. 9102,798. The increase is chiefly caused by the extra credits necessitated by the low Nile flood.

The following table gives a summary of the year's expenditure:—

TABLE IV.

TOTAL EXPENDITURE IN 1904. Tables I. II. III.

	L.E.	M.
Ordinary budget	1000128	392
Extraordinary budget	809405	979
Various extra credits (1)	75356	931
Total... ..	<u>L.E. 1884891</u>	<u>302</u>

	L.E.	M.
(V) Irrigation Service	25874	331
State Buildings Department	13405	565
Survey Department	30387	000
Museum Department	5260	669
Central Office	429	366
Total	<u>L.E. 75356</u>	<u>931</u>

The above total is greater than that of 1903, by L.E. 72487, 872 mm.

In the present report, I have not included the expenditure entailed by the construction of the Nile—Red-Sea railway, the Abu Hamad-Kareima railway, or the formation of the new harbour in the Red Sea—to be called Port-Sudan. All of the above works have been placed, during construction, under my control, and the expenditure upon the first two items, in 1904, has been very considerable. As these undertakings, however, belong purely to the Sudan, and as, moreover, the progress upon each is given in the Governor General's Annual Report, I have thought it sufficient to merely mention the fact that the expenditure, given in Table IV, by no means represents the total actually controlled last year by the Egyptian Public Works Department.

The formation of an Irrigation Service in the Soudan took place in November 1904. As the expenditure—up to the end of last year—was very small, I will reserve my remarks upon the progress made by this Service, for next year's report.

I will now briefly describe the work done in 1904 by the several services attached to the Public Works Ministry, separating my report into two portions, namely "Irrigation Works," and "Works other than Irrigation."

Part I.—IRRIGATION WORKS IN 1904.

THE SEASON AND THE WATER SUPPLY.

The supply in the Nile, at the commencement of 1904, was a good one, better indeed, for the same period, than that of any of the four preceding years. On the 1st of January of last year, the Wadi Halfa gauge reached a water-level of 3·12 metres, or only ·56 metres below that (for the same date) of 1899, a year of exceptionally good summer supply.

The Wadi Halfa level, above mentioned, was 1·19 metres higher than that for the 1st of January 1900; the worst year on record as regards the supply in the Nile during summer. These favourable levels were fairly well maintained throughout the winter and spring months. The rise (at Khartoum) was an early one, commencing on the 1st of May. At this period, all promised well for a satisfactory season, but, on the 8th of June, the river level at Khartoum began to fall, and, by the 28th of that month, the increase had been arrested to such an extent, that its total amount—above the minimum of the year—was only ten centimetres. Thus, the rise which had at first promised to be early, was converted into a late one.

This fall-off, or cessation of the rise, for a period of twenty days, was most inopportune, occurring, as it did, just at the period when a steady and continued increase in the river levels was most essential to the interests of Lower Egypt. Its effects might have been disastrous, had it not been for the fact that the good supply which had continued throughout the spring, had rendered it possible to store up the water impounded in the Aswan reservoir, and delay making use of it until as late a date as the 10th of May. Consequently, when the cessation of the rise took place, there was plenty of water available—stored upstream of the dam—with which to supplement the supply required for the Delta.

The extent, and the effect, of the aforesaid drop, or fall-off in the levels, may be understood from a study of the Wadi Halfa gauge returns. On the 8th of July 1904, the river levels at that place coincided with those, for the same period, of the year 1900 (the worst year known), and, subsequent to that date, they even fell below them

for some days. It was not until the 19th of the same month that the water levels, of the two years in question, again became identical.

Last year's flood, up to the 10th of August, was a normal one, but, after that date, the rise was exceptionally feeble, and 1904 must take its place among the series of years characterized by poor floods. That of last year was but little better than the flood of 1902, which was the lowest but one of which we have any record.

The maximum level (at Aswan) was attained on the 13th of August, when 14 pies, 11 kirats were recorded on the gauge. The levels then dropped, until on the 30th of the same month, they fell as low as 13 pies, 3 kirats. This fall was followed by a slight rise, but, on the 14th of September, the regular fall commenced, and, after that date, was continued rapidly.

To give an idea of the poverty of last year's flood, it may be mentioned that the mean maximum level at Aswan is 16 pies, 2 kirats. Consequently, the maximum for 1904 was 0·87 metres *below* that of an average year.

The fall at Khartoum was remarkably rapid, and, on the 20th of December, the readings for last year coincided with those for the same date in 1900, which, as has already been mentioned, was the lowest of which we have any record. As the fall was continued steadily to the end of the year, it cannot be asserted that the prospects of a good summer supply in 1905 are very reassuring.

To sum up, the supply in 1904 was good during the months of winter and spring. It fell off about the middle of June, and after that was below the average. The flood was late in arrival, and a very poor one. From the latter half of August, and throughout September and October, the levels were extremely low, and at the end of the year coincided with those of the lowest year on record.

SUMMER IRRIGATION IN 1904.

Thanks to the good levels above mentioned, which permitted the water to be stored in the Aswan Reservoir, and to the early rise in May, which allowed of its being rapidly emptied, no difficulty of any sort was experienced with regard to the summer irrigation of Middle and Lower Egypt.

The following comparison will show the difference between the programme originally approved for emptying the reservoir, and that actually carried out:—

(a) *Original programme.*

Dates of emptying.	Discharge from reservoir
From 10th May to 20th May	2,000,000,000 m ³ per diem.
> 21st > > 30th >	10,000,000,000 >
> 31st > > 12th June	20,000,000,000 >
> 20th June, until empty	25,000,000,000 >

(b) *Programme actually followed.*

Dates of emptying.	Discharge from reservoir.
From 10th May to 20th May	4,000,000 m ³ per diem.
> 21st > > 5th June	10,000,000 >
> 6th June to 10th >	30,000,000 >
> 11th > until empty	35,000,000 <

The rate at which it was possible to empty the reservoir was accelerated by the early and satisfactory rise at Khartoum in May. As this rise was, unfortunately, not maintained, it would, as things turned out, have been better to have adhered to the original programme. The actual effect of the quick discharge was—owing to the long break in the rise—to cause a reduction of the supply reaching the Delta Barrage, of from 72,000,000 metres cube on the 15th of July, to 69,000,000 metres cube on the 22nd of that month.

No serious results were caused by this drop of 3 millions of cubic metres per diem in the river discharge, but, as, during the month of July, the demand for water in Lower Egypt invariably increases steadily, and with great rapidity, it would have been more satisfactory had the supply in the river, during that month, also increased steadily and without any break. Even had the early flood reached Aswan before the reservoir had been entirely emptied, no harm could have been caused, as the discharge passing through the sluices, under such conditions, must necessarily have been less—even with the added water—than that which would have passed through the dam when the flood was at its maximum.

In consequence of the regulation of the Asyut Barrage and the supplementary supply from the reservoir, the water levels during summer, at the head of the Ibrahimia Canal, were the highest on record for that season of the year.

The extra water was required in consequence of the increased area of converted basin, but one result was, that only very easy rotations were required in the old "sefi" area of Middle Egypt, and the extra supply was given to the newly converted lands in Asyut and Minia, and to the extension of the "sefi" area in the Fayum. The whole of the Minia basins received "sefi" water in 1904.

Rotations on the Ibrahimia Canal commenced on the 1st of May and were discontinued on the 20th of July.

The Delta Barrage again rendered excellent service. The Rosetta Barrage was closed on the 6th of April, but that of the Damietta branch passed water down until the end of May, and was again partially opened between the 22nd of June and 17th of July, in order to freshen the water passing down this branch.

On the 27th of July the opening of the gates commenced, and was continued until the river passed freely through the openings.

In consequence of the early rise and good supply, the prohibition against the irrigation of land for the early maize sowings was removed on the 15th of June. As no one in Lower Egypt irrigates land for maize before that date, this was practically equivalent to no prohibition at all.

To show how good was the supply in Lower Egypt during the summer of 1904—thanks to the reservoir water—it may be mentioned that the discharge available in the river in that year, between the 1st of May and the 15th of July, averaged 58,000,000 of metres cube per diem, as against 47,000,000 of cubic metres per diem in the year 1903.

Thanks to the completion of the Aswan Reservoir, there has been, everywhere in Lower Egypt, a marked improvement in the water supply. Whereas, in former years, the common complaint used to be that the canals were either dry, or contained a quite inadequate supply in summer; nowadays the cultivator grumbles if he is obliged to lift the water on to his fields by water-raising machines, and if he does not get it "free-flow".

The earthen dam, to prevent the ingress of salt water and, at the same time, to store water for irrigation, was again made in the Rosetta branch last year, at, or near, Mehallet-el-Einir. This work was begun on the 28th of January and completed by the 1st of May. A cube of

some 145 millions of metres of water, was drawn off the pond above this dam; sufficient to give five waterings to an ordinary crop of 65,000 feddans, between May and August. No dam was made on the Damietta branch last year; indeed, since the year 1893, no work of this kind has been carried out.

As such a dam would, however, usefully store some 80 millions of cubic metres of water, it is intended to construct it in 1905, and when (after three years) the conversion works in Middle Egypt and Giza, and the extensions in the Fayoum, have been completed, and these provinces daily draw from 5 to 6 millions of cubic metres of water, in excess of that drawn off last year, it will then be impossible to dispense with this dam, and it will be a question whether it will not be advisable to replace it by a permanent masonry weir.

The Atfeh pumps—on the Rosetta branch—were worked for sixty-one days, and raised a cube of some 34 millions of metres from the river, which was passed into the Mahmudyeh canal.

The summer rotations in Lower Egypt were exceptionally easy last year. It was originally intended to enforce them for a 21-day period on the canals, that is to say, that all outlets on a given reach should be open for six, and closed for fifteen days. Actually, however, on account of the good supply, they commenced with only a sixteen-day rotation, namely, eight days open and eight days closed. Even this was afterwards reduced, as the supply increased. Rotations commenced in Lower Egypt in the beginning of June, and were generally taken off by the middle of August, although in a few of the canals of the Sharkieh province, not provided with proper outlets, they were continued as late as the 7th of September.

With regard to the distribution of the summer supply in Lower Egypt, I would refer anyone desirous of information to Mr. Verschoyle's report, which is full of much interesting detail upon this subject.

FLOOD IRRIGATION IN 1904.

Although, as has been already stated, the flood rise was normal in the earlier stages, this fact rendered no assistance to the basin irrigation of Middle Egypt, as a rapid fall in the river levels occurred, at the very time that the feeder canals of the several basin systems were being opened, and when they should have been discharging large volumes of water.

Owing to the rapid fall after the 13th of August, the Ministry of Public Works declared a Bad Flood, and orders were issued to carry out the basin irrigation in accordance with the rules laid down in previous low floods.

In consequence of the poor levels which prevailed throughout the period when the basins should have been filling, very special measures were necessitated in order to ensure that the water entering the canals should be economically utilized. The bottom gates of the Asyut Barrage were never lifted at all throughout the flood, and the regulation of the entire system was most carefully carried out, while the "sarf," or emptying of the basins, was most skilfully manipulated by the Irrigation staff. Mr. Webb, in his report, describes the procedure in much detail, and his account of the difficulties that occurred, but that were so happily overcome, is full of interest, and will be most valuable as a guide for future years of similar supply.

The results of the efforts of the Irrigation staff in 1904, was that the area of basin land left "sharaki," or unirrigated, was very much smaller than had ever been the case in previous years, of similar low floods, as the following comparison will show :

Year.	Sharaki area.
1877	753,992 feddans
1888	269,110 »
1899	188,137 »
1902	128,663 »
1904	45,871 »

Although the flood of last year was not quite as low as that of any of the years above mentioned, the difference in favour of 1904 was extremely small, and the flood was below the average to quite an exceptional degree.

The entire Irrigation staff of Upper Egypt deserves much credit for the manner in which it made use of every drop of water available. In this respect Mr. Webb himself merits the chief share, as he it was who directed and controlled the general operations. Of the officers serving under him, of whom special mention should be made for their services during the flood, the names of Mahmud Bey Sidky, Hussein

Bey Wassif, and Mr. P. Tottenham, the Inspectors of the different irrigation circles concerned, must come first. It was entirely due to their exertion—in which they were ably seconded by their subordinates, and by the Mudirs of the several provinces,—that the area of unirrigated land was not very much larger than actually has been the case.

The greater part of the "sharaki" area occurred in the provinces of Aswan and Kena. For the former, nothing can be done but to erect pumping stations at different points, but for the latter, relief will be given by the construction of a barrage, or weir, across the river at Esna. Mr. Webb has urged the construction of this work for several years past. It will be commenced in 1906, and will probably take four years to complete, but once completed, this province ought to be independent of the height of the flood, as, during low years, it will be possible to raise the water levels of the river, and thus secure the irrigation of the basin lands.

In Lower Egypt, the province which usually feels a low flood most severely is Ghizeh, particularly that portion of it on the east bank of the river. Curiously enough, this tract fared rather better than might have been expected last year, and the total "sharaki" area was only some 8,000 feddans. It is intended shortly to erect pumps for the irrigation of this tract of country. They will be commenced in 1905, and when erected will be worked by the Government.

At the Delta Barrage, the crucial level of 15.50 was reached as early as the 22nd of June. This was due to the water sent down from the Aswan Reservoir, but up to the 27th of July, the rise was so slow that the canals absorbed the entire extra supply, and the level above the Barrage remained constant. After that date, the volume increased, and water was passed into the two branches of the river, but the Barrage itself was never fully opened until the canals were closed in the month of October.

Flood rotations commenced generally between the 15th of August and the 1st of September. The periods were seven days of alternately high and low levels. Now that the people have begun to understand the benefits of lowering the flood levels in the canals at certain periods, they thoroughly appreciate this measure.

The Zifta Barrage rendered great service to the irrigation of northern Egypt during the flood of 1904, and the new western canal—the Rayah Abbas, worked steadily from the 31st of July to the 20th of November. Last summer's experience has emphasized the necessity of constructing a subsidiary weir downstream of this work, similar in general design

to those constructed below the Delta Barrages. Such a work is requisite in order that the Zifta Barrage may be able to hold up water to a higher level than is at present possible, and in order that full advantage may be taken of the arrival of the early flood. This weir will be commenced in the summer of 1905.

DUTY OF WATER IN 1904.

Both Inspectors General give tables of the duty of water for the several provinces under their respective control, and discuss these figures at some length. I will merely say that the results are extremely variable, but that the average duty would appear to work out to about 34 metres cube of water per feddan irrigated.

CROPS IN 1904.

The winter crops, both in Upper and in Lower Egypt, were generally good, but the cotton crop, in Lower Egypt, must be classed as a comparative failure. As in 1903, a very large area was planted with cotton, and water was everywhere abundant. In some districts, notably in the provinces of Behera and Sharkia, the loss was very considerable. At one time, the crop promised to surpass all previous records, but towards the end of July, worms became very prevalent, and, in certain localities, they almost destroyed the crop. Fogs in the autumn, and worms in the bolls completed the tale of disaster.

All experience goes to show that it is the temperature, during the months of September and October, which really decides the out-turn of the cotton-crop. Worms, in the summer, may, and do, cause considerable damage, but, at that season, they attack the leaf only, and may be destroyed by picking the leaves on which they collect. In the autumn, unfortunately, no relief is possible. Damp cold nights, and fogs in the morning, followed by a hot sun, prevent the bolls from opening and cause them to shrivel up. To make matters worse, another worm appears at this period, which attacks the bolls themselves.

The crop of last year had a series of ills to contend with, as owing to the scarcity of cattle, due to the cattle disease, much of the land was only partially tilled, and the exceptionally cold spring retarded the planting. This, in many places, necessitated a second sowing. Again, in Lower Egypt, there was no continuous heat during the summer of last year, until the season was far advanced, too late to be of much use.

Water was everywhere plentiful throughout the summer; too plen-

tiful perhaps. There is little doubt that the practice, so prevalent among the Fellahin, of drenching the cotton plants with water during the hot season, is bad for the yield. Under a hot sun, the atmosphere, beneath the leafy shade, must be steamy, and exceptionally suited to the production of the cotton worm. It is to this bad habit, as well as to over-cropping the land, and to making use of inferior seed, that the deterioration of the Egyptian cotton crop is undoubtedly largely due. The latest returns from the Alexandria General Produce Association estimate the total out-turn of cotton for last year at some 6,200,000 kantars. Of this, Middle Egypt contributes over a million kantars, and shows a steady yearly increase, as the following tables will show. Here, there was no damage done-by worm.

Year.	Area planted.	Yield.
1900	92,842 feddans	365,000 kantars
1901	105,750 >	432,000 >
1902	95,356 >	471,150 >
1903	153,000 >	765,000 >
1904	250,205 >	1,110,000 >

It will be seen that the increase is a very considerable one; it is, of course, chiefly due to the conversion of the basins to perennial irrigation. Had it not been for the substantial addition to the total contributed by Middle Egypt, the return for Egypt, as a whole, in 1904, would have been poor indeed.

THE SUGAR-CANE CROP FOR 1904.

There is a considerable difference in the returns for the crop of last year and that of 1903. The reduction is due to the closing of several of the Daira Sanieh factories, when taken over by the Société des Sucreries de la Haute-Egypte, and a consequent diminution in the area planted with cane.

The following are the returns supplied by the Upper Egypt factories :—

SEASONS.		Cane crushed.	Out-turn of No. 1 sugar.
		kantars.	kantars.
1899-1900	... ..	21,969.136	2,080.637
1900-1901	... ..	20,131.223	1,975.337
1901-1902	... ..	20,506.165	1,928.886
1902-1903	... ..	19,719.209	1,870.582
1903-1904	... ..	15,044.276	1,486.386
1904-1905	... ..	11,943.900	1,030.312

“QEDI” OR SUMMER DURRAH.

An area of 92569 feddans was planted with this crop last year in the basins of Upper Egypt. This is very similar to the average of the last five years.

LAKE VICTORIA NYANZA GAUGES.

The following are the corrected readings on the Kisumu gauge, for the 1st of October for each year, and the mean yearly levels of the lake :—

YEAR.	Gauge reading on 1st October.	Mean gauge of lake for the year.
1896... ..	1.39	1.578
1897... ..	missing	missing
1898... ..	1.63	incomplete
1899... ..	1.14	1.398
1900... ..	0.99	1.041
1901... ..	0.99	1.158
1902... ..	0.84	0.822
1903... ..	1.62	1.381
1904... ..	1.50	1.560

The above figures show that the lake is now passing again through a series of years of high water-level, subsequent to the three low years of 1900, 1901 and 1902. I give the above figures as being of general interest, but all our latest information goes to show that the levels of

Lake Victoria have little or no effect in influencing the volume of the water which leaves the outlet of the Albert lake, and which passes down the Bahr-el-Gebel, or White Nile. It seems to be almost certain that it is upon the level of this latter lake, that the supply of the Nile depends, and that this sheet of water is the real reservoir, and, to a certain extent, the regulator of the Upper Nile. Lake Victoria discharges a large and varying volume of water into the river channel, below the Ripon Falls, it is true, but, owing to the existence of the chain of swampy lakes—known as Choga—through which it passes for some fifty miles after leaving the upper plateau, the discharge of the river is so regulated, that the volume—due to Lake Victoria—arriving at Foweira and from there passing on to Lake Albert, is practically constant throughout the year. Any increase below the Murchison Falls is most probably due to rain-fall in the catchment area of the lower portion of the Victoria Nile itself, and not to the level of the Victoria Nyanza.

I repeat, however, that the gauges of the Victoria lake are of interest, as the rain-fall over the catchment basins of both this lake and that of Lake Albert most probably corresponds in density, and if the former lake is high at the end of any given year, in all probability the levels of the latter will be the same.

That this is so, the records of Lake Albert, for the two years during which the Butiabu gauge has been in existence, would seem to prove. In both lakes, the levels at the end of 1904 appear to be high, and only a little lower than those of 1903.

THE CUTTING OF THE "SUDD" IN THE BAHR-EL-GEBEL.

The clearance of the only remaining obstacle to through navigation in this river, known as Block 15, was undertaken by Lieut. Drury, R.N., in the early months of last year. The work involved was both long and difficult, but it would certainly have been successfully accomplished had not Mr. Drury's health entirely broken down, shortly before its completion. In consequence of his illness, the work had to be abandoned for the season, but in November of last year, another naval officer, Lieut. Scott-Hill, recommenced it, and succeeded in cutting through the last block, in the early months of 1905. The Bahr-el-Gebel is now clear of "sudd" throughout its length, but this particular block will require some looking after, in order to prevent its again closing up. I have lately visited it, and noticed that the channel has not been cleared to its full width throughout. Such clearance is most necessary, as the "Um Suf" grass—which is the chief cause of the blocks—is encroaching on the channel upon either side. A comparatively small expenditure next winter would make it safe, and this work should certainly be done.

EXPEDITIONS TO STUDY THE NILE SOURCES.

The results of the two expeditions which were despatched for this purpose in the winters of 1902-03 were published last year in the form of a Blue Book, with my general proposals regarding the studies required and the projects to be considered. These proposals were conditionally accepted by the Egyptian Government, and the formation of a permanent Irrigation Service in the Soudan was approved. Mr. C. E. Dupuis was appointed Inspector General to this Service, with Messrs. Tottenham and Walsh as his assistants—and a large staff of surveyors. As these officers only commenced work in November 1904, it is too early to make any mention of it, but by the end of the current year, we may expect a very interesting increase to our knowledge of the river and its tributaries.

THE ASWAN DAM.

The question of the raising of this dam has for some time past been under consideration. By raising it another six metres, the storage capacity of the reservoir would be doubled. The project, with all necessary drawings and calculations, was prepared by the Irrigation Engineers, and submitted to Sir Benjamin Baker (the Consulting Engineer for this work) for examination.

In October, 1904, I was informed by him, privately, that a new theory with regard to the stability of masonry dams had been brought forward by Messrs. Atcherley and Carl Pearson, Professors at the University of London, and that this theory was exciting considerable attention among hydraulic engineers in England and in France.

On receipt of this information, I, with the approval of the Egyptian Government, requested Sir B. Baker to come out to Egypt, and examine the dam—after two years' work—and further to advise us as to the possibility of raising it as proposed. He visited the work last winter, and eventually recommended that we should postpone raising it, at any rate, for another two years. He further recommended extensive protective works on the talus downstream of the dam, where the severe action of the water through the sluices had eroded even the sound granite. I ought to say that we had recognised the necessity of these protective works ourselves, and had already commenced them. We had in 1904 completed the repairs of certain of the worst places, and were intending to spend a further sum of L.E. 50,000 in 1905. Sir Benjamin, however, recommended protective works upon a still larger scale than

this, which will involve an expenditure of something like a quarter of a million of money, and take two years to complete. Meanwhile the question of the raising of the dam will remain in abeyance.

Sir B. Baker in his report further gave the satisfactory assurance that, in his opinion, the dam was perfectly safe and sound throughout, and that there was no reason whatever for the slightest anxiety regarding its stability.

EXPEDITION FOR STUDYING THE NILE CATARACTS.

As a consequence of the above decision, it has been decided to make a complete and detailed survey of the Nile cataracts, south of Wadi-Halfa, and to study the possibility of constructing another dam and reservoir somewhere to the south of the existing one. Such a supplementary work will probably be necessary, under any circumstances, even should the Aswan dam be raised, as the future wants of Egypt will necessitate a very large amount of water being stored. In any work of the kind, constructed south of Wadi-Halfa, a navigation channel and locks may be omitted, as, with the railway from Wadi-Halfa to Khartoum, no through river traffic is likely to arise, more especially as, on this reach of the river, it must always be difficult and dangerous, and only possible during flood.

The survey parties will commence work in the autumn of 1905.

IRRIGATION EXPENDITURE FOR 1904.

TABLE I.

ORDINARY BUDGET.

	L. E.	M.
Central Office (including purchase of equipment for the Sudan)...	62128	649
Upper Egypt..	251952	986
Lower Egypt..	327433	645
Total...	<u>L. E. 641515</u>	<u>280</u>

TABLE II.

EXTRAORDINARY BUDGET.

	L. E.	M.
Ziftah Barrage (Caisse de la Dette) ...	14385	734
Drainage Works (Caisse de la Dette) ...	29768	455
Irrigation improvements (Caisse de la Dette) ...	541084	217
Nile protection (special reserve fund) ...	8209	690
Total...	<u>L. E. 593448</u>	<u>096</u>

TABLE III.

VARIOUS SPECIAL CREDITS.

	L.E.	M.
Special low Nile works (Caisse)	911	082
Special low flood credit	13987	436
Sudds in Rosetta branch	9998	007
Barrage Gardens (Finance)	977	806
Removal of sudds in Bahr el Gebel	429	366
Total... ..	<u>L.E. 26303</u>	<u>697</u>

The figures in these three tables, added together, give the total expenditure upon Irrigation works for the year, thus :

TABLE IV.

TOTAL EXPENDITURE, 1904.

	L.E.	M.
Ordinary budget	641515	280
Extraordinary budget	593448	096
Various special credits.. ..	26303	697
Total... ..	<u>L.E. 1261267</u>	<u>073</u>

This is less than the expenditure, under the same heads in 1903, by L.E. 27010.140 Mill.

The ordinary budget may again be subdivided as follows :—

TABLE V.

	L.E.	M.
(a) Regular budget	222030	612
(b) Corvée relief (Caisse)	249999	393
(c) Corvée relief (Finance).. ..	157337	954
(d) Agricultural roads	6291	200
(e) Special credit for bridges to replace ferries	5856	121
Total... ..	<u>L.E. 641515</u>	<u>280</u>

(a) The item "Regular budget" is thus subdivided:—

TABLE VI.

	L.E.	M.
Establishment	83770	722
Contingent charges	23039	780
New works	12916	301
Maintenance and repairs	82362	006
Khatatbeh and Atfeh pumps	600	000
Drainage of Lake Mareotis	14000	000
Land charges	534	517
Purchase of equipment for Sudan Irrigation Service	956	462
Etsa pumping station	3850	824
Total... ..	<u>L.E. 222030</u>	<u>612</u>

or more than the expenditures in 1903, under this head, by L.E. 20970.033.

(a) Table V. None of the items in this last table call for any very special remarks. The sum allotted to maintenance and repairs was considerably larger in 1904 than that for the previous year, but the sum allowed for new works was correspondingly reduced. The Etsa pumping station represents a new charge which will, in future, like the expenditure on the Mex, Khatatbeh and Atfeh pumps, appear annually in the items of the budget.

(b and c) TABLE V.—CORVÉE RELIEF.

Here again, but little need be said, as this expenditure is practically the same from year to year. The distribution of the money furnished by the Caisse was the same as that of 1903, and the credit supplied by the Ministry of Finance was again distributed according to the necessities of the different provinces in which corvée relief works were undertaken. The following table shows a subdivision of the expenditure in 1904 :

TABLE VII.
CORVÉE ABOLITION.

CORVÉE ABOLITION	Upper Egypt.		Lower Egypt.		Total.	
	L.E.	M.	L.E.	M.	L.E.	M.
Caisse money	128000	000	121999	393	249999	393
Regular budget	50746	783	106591	171	157337	954
Totals... ..	178746	783	228590	564	407337	347

(d) TABLE V.—AGRICULTURAL ROADS.

The following shows the work done and the expenditure incurred last year :

LOCALITY.	Length of roads existing previous to 1901.	Length of new roads constructed in 1901.	Expenditure in 1904.	
	Kilometres.	Kilometres.	L.E.	M.
Upper Egypt and the Fayum... ..	638	50666	2598	128
Lower Egypt... ..	1863·140	17850	3693	022
Totals... ..	2501·140	68·516	6291	200

This expenditure, as shown above, is rather misleading, as, apparently, road construction in Lower Egypt has been costly, out of all proportion to that in Upper Egypt. This is not so, and the figures really represent the expenditure due for land taken up in the previous years for roads, but not paid for, owing to delay in the preparation of the registers. For several years now, road construction in Egypt has been suspended, except upon a very limited scale, in consequence of the impossibility of finding funds wherewith to maintain these roads when completed. I am glad to say that, in the Budget for 1905, a sum of L.E.10,000 has been allotted for this purpose, and road construction may in future be expected to show considerable annual progress. The demands for new roads are steadily increasing, and the people fully appreciate the advantages gained by easy communications.

In Asyut Province, a programme for eight new roads has been approved by the Provincial Council, and work has been commenced.

In Minia, a similar programme is under consideration, while the Province of Girga has voted a sum of L.E. 18,000 for the construction of four new roads. Work upon these last was commenced last year.

(c) TABLE V.—BRIDGES TO REPLACE FERRIES.

The total expenditure, granted by the Caisse in 1904, was L.E. 5856.121 Mill.; of this sum, L.E. 900 were spent in Lower Egypt upon the construction of two bridges, while the balance was devoted to the construction of 29 new bridges over the Ibrahinnia canal. These bridges are estimated to cost L.E. 21948, and the balance required, over and above that given from the ferry fund, has been collected by a local cess.

NEW WORKS AND REPAIRS IN 1904.

The details of these works have been so fully treated by the Inspectors General of Irrigation, in their respective reports, attached to this note, that my remarks will be very brief, and will only touch upon the more important items of expenditure.

(a) *Upper Egypt.*

Here, by far the heaviest and the most important expenditure has been that of the conversion of those basins which are to benefit by perennial irrigation, consequent to the completion of the Aswan Reser-

voir. These works have now been in progress for several years, and will, it is hoped, be completed by 1908.

The provinces affected by them are those of Asyut, Minia, Beni-Suef, and west Giza.

In 1904, a sum of L.E. 423,166 was expended, and the total cost, up to the end of that year, has been L.E. 1,292,770. In this, 205,522 feddans of land, irrigated as basin, have been converted to perennial irrigation. If to this figure be added the cost of land expropriated, but not yet paid for, the total expenditure works out to L.E. 1,400,000, or just about L.E. 7 a feddan.

The total area to be converted is 451,000 feddans, so that nearly half of this has been completed. It is expected that, by the end of 1908, the whole area will be ready for perennial irrigation. The following are the latest estimates, as prepared by Mr. Webb :

	L.E.
Cost of actual conversion works... ..	1,739,506
Widening Ibrahimia Canal... ..	512,383
New Giza canal	171,000
Drainage channels... ..	267,336
Pumping stations	150,000
Establishment and maintenance for six years... ..	180,000
Contingencies... ..	179,775
Total	<u>3,200,000</u>

	L.E.
The Expenditure to the end of 1904	1,292,770
Grant for 1905.	403,000
Total	<u>1,775,770</u>

If this sum be deducted from the total estimate of L.E. 3,200,000, the balance still required to complete the conversion of the whole area of 451,000 feddans is L.E. 1,424,231. At the present rate of expenditure, which is as large as it is possible to make use of consistent with good work, three more years will be required, so that, as has been already stated, it will be the end of 1908 before the entire area is converted.

This expenditure is undoubtedly very heavy, but the figures which Mr. Webb gives in his report, as to the results already obtained, show conclusively that it has been fully warranted.

I have already written a note regarding them, which has been published in Lord Cromer's Annual Report upon Egyptian Administration for 1904. I need not then repeat my remarks here, more especially as Mr. Webb's figures are very clear. I will only, then, mention that, for an expenditure of some 6½ millions (including the cost of

the reservoir works), by the end of the year 1908, the annual rental value of the lands affected in Middle Egypt, should be increased by L.E. 2,637,000, and its sale value by L.E. 26,570,000.

In addition, the Government will gain, in the shape of increased revenue from the converted lands, an annual sum of L.E. 226,500, and also largely, though indirectly, by the increased wealth of the country, and the consequent increase in the Railway and Customs receipts.

It must be admitted that these results, if realized, will be remarkable, and there is every reason to be confident that they will be realized in full. Everything seems to promise that, in the course of the next decade, Middle Egypt will approach the conditions of an Agricultural Paradise, more nearly than any other spot upon the world's surface.

Mr. Webb and Ismail Pacha Sirri, with all those who have assisted them in this work, have every reason to be proud of the results of their long and heavy labours.

In addition to the above works, a large amount of other important work was carried out in Upper and Middle Egypt last year.

The following is an abstract of the chief items of expenditure:—

	L.E.
Fayum remodelling	62015
Hoshas West Yusifi	5329
Repairs to Deirut escape	3855
" to head of Ibrahimia Canal	2244
Walidiyeh syphon... ..	1746
Land and petty projects	4647
Many works in Girga	2476
Hod Hammal railway diversions	1856
Aswan dam protective works	6500
Total L.E.	<u>90668</u>

In the Fayum, Mr. Clowes, the Inspector of Irrigation, 4th Circle, has done an immense amount of good work, and thanks to his vigorous initiative, this province has benefitted much from the increased water supply. The chief projects in progress are the remodelling of the canals Seileh and Gharrak.

Most of the other works mentioned in the above list are repairs, but the item concerning the Aswan dam requires a few words of explanation.

I have already said that, last year, we undertook certain protective works downstream of the dam. The places treated were those below the sets of upper sluices on the east and the west, and it is to them that the above expenditure more particularly refers, although a portion of it was for the construction of cross-walls in one of the sets of sluices,

at medium level. The work, as carried out by Mr. Macdonald, succeeded admirably, and, so far, not a stone has been moved. We had intended carrying out similar works, upon an extended scale, in 1905, and an estimate for L.E. 50,000 had been sanctioned. Before the end of the year an advance of L.E. 20,000 was granted by the Ministry of Finance, and L.E. 12,828 was expended on the purchase of cement. Sir Benjamin Baker's visit, however, as has already been explained, has entailed a still further expenditure, and we have consequently decided to carry out similar protective works across the whole bed of the river downstream of the dam. That such works should be necessary is not to be wondered at, and was not unexpected. Anyone who has seen the water tearing through these sluices, when the reservoir is full, must have wondered, not that the rock has been worn away, but that any material could have resisted the effect of such a mass of water, constantly thundering upon it, at such a velocity.

Before leaving the subject of the work done in Upper Egypt, I should say a few words upon two, which deserve special mention, although the expenditure incurred is included in the total given before for the conversion of the basins. These two works are the remodelling of the Ibrahimia Canal and the Etsa pumps.

The Ibrahimia Canal is the main summer supply canal for all Middle Egypt, south of Asyut. In consequence of the large area to be thrown upon it, it requires very considerable widening throughout its length of 207 kilometres. A portion of this work has been done by dredging, but much of it has to be done during temporary closure in the winter.

The estimated cost of the entire work is L.E. 419,853, of which L.E. 290,766 has been spent up to the end of last year.

The Etsa pumps have been erected to throw the water of the great central drain into the Nile during flood, when the levels of the river are too high to permit of the drain working by gravitation.

This pumping station was completed last year at a total cost of L.E. 48,744. It consists of four vertical direct acting engines of 165 H.P. each, with four centrifugal pumps of 40 inches diameter.

Last year it worked from the 16th of August to the 2nd of September and again from the 9th to the 21st of October.

THE ASYUT BARRAGE.

As there has been some erosion of the talus downstream of this work, it has been decided to lengthen it, and at the same time repair it. A sum of L.E. 15,000 has been granted for this purpose in 1905.

(b) *Lower Egypt.*

I have written at some length about the benefits caused to Upper Egypt by the conversion works. In Lower Egypt, an equal amount of work has been done, and equally good results have been realized, but these works have been more gradual in their effects, and have been spread over a large number of years. Former Inspectors General of Irrigation, Mr E.P. Foster and Sir R.H. Brown, did much to improve the agricultural conditions of Lower Egypt, and of late years, Mr Verschoyle and his staff have been continuing the good work with undiminished energy, and with equally good results. Many hundred miles of new drains have been constructed, and many hundred miles of faulty canals have been remodelled and improved. The Delta Barrage, with its subsidiary weirs, had been put into thorough repair, and a new barrage has been built across the Damietta branch of the Nile at Zifia. Owing to careful regulation, and to special works for preserving a regular section, the huge cubes of silt that were formerly removed annually from the canals have been much diminished and, thanks to the Aswan reservoir, the supply of water for the existing cultivated area is an ample one.

The increased value in the rental and sale of land in Lower Egypt bears ample testimony to the work of the last 15 or 20 years, and when some project for increasing the Nile summer supply on a large scale, has been realized, there is ample room for a large extension of irrigation in the lands, at present lying waste, in the northern tracts of the Deltaic provinces.

The total expenditure in Lower Egypt under the special credits in 1904 was L.E. 138,046, and a further sum of L.E. 45,962 was allotted from the ordinary budget for new works.

This was entirely expended upon improving the irrigation and drainage systems in Lower Egypt. For details I must refer anyone requiring information to Mr. Verschoyle's report. A large number of masonry works were carried out, and L.E. 38,650 was expended upon new drains.

Upon maintenance, a sum of L.E. 251,984 was spent, or nearly double the expenditure for the previous year.

To show the economy that has taken place in the way of canal clearance, I may mention that the dredging cubes in 1904 were only 842,627 metres cube, whereas six years before they reached the total of 1,510,438 metres cube.

A sum of L.E. 13,000 was expended upon improving the Nile banks, and six diversions were made at the most dangerous spots. L.E. 16,286 were spent upon works in connection with the Zifta Barrage.

THE MEX PUMPS.

These pumps lifted a cube of 310,017,839 metres in 1901 at a cost of L.E. 10,158, or L.E. 32,766 Mill. per million cubic metres of water lifted.

This is the smallest quantity pumped during the last four years. This satisfactory result is, however, largely due to a small rainfall in the vicinity of Lake Mareotis.

THE WADI TUMILAT.

The improvement of this estate by Mr. Langley is progressing satisfactorily.

	L.E.
The revenue for 1904 was...	30655
The expenditure for 1904 was ...	22732
Surplus...	<u>7923</u>

The following shows the growth of nett revenue :

	L.E.
1899 ...	222
1900 ...	290
1901 ...	720
1902 ...	1593
1903 ...	6649
1904 ...	7923
Total...	<u>17397</u>
Add sale of steam ploughs...	1267
" " " coal...	34
Total...	<u>28698</u>
Deduct purchase of 63 ½ feddans of land ...	1117
Total...	<u>17581</u>

As the estimated surplus, according to the original estimates for the six years in question was only L.E. 7760, the actual results may be considered as very satisfactory.

The total capital expenditure advanced by the Ministry of Finance for this estate is shown below :—

	L.E.
Advance ...	45,010
Deduct surplus of ...	<u>17,581</u>
Balance still due ..	<u>L.E. 27,429</u>

At the present rate of advance this ought to be entirely paid off in four years and the estate be then free of all liabilities.

The area rented in 1904 was 16,974 feddans and pumping charges amounted to L.E. 4,056.

THE NILE CORVÉE IN 1904.

The following are the figures :—

LOCALITY	NUMBER OF MEN CALLED OUT FOR 100 DAYS	
Upper Egypt...	9641
Lower Egypt	220
Total...	<u>9641</u> men for 100 days

The figures for Upper Egypt are still high, but the basin banks require a large number of watchmen, and the protection of the new canals and banks, in the area recently converted, is responsible for some of 3,000 of the total. As the banks become consolidated, these men will be gradually reduced.

It is open to question, whether, in Lower Egypt, the numbers of watchmen have not been unduly reduced. There are many places on the Nile banks where protection during flood would probably save work afterwards.

One fact is certain, the first high flood that reaches Egypt, after the long period of low floods, during which the banks have been subjected to but little strains, will necessitate a very large increase in the number of men that must be called out to guard the banks.

IMPROVED PAY AND PROMOTION FOR NATIVE ENGINEERS.

I am glad to say that the pay and prospects of the subordinate staff of native engineers in the Public Works Department has been considerably improved since I wrote last year. A scheme was presented to the Government in 1904, for raising the pay of all grades, and holding out prospects of a good and sufficient salary to native chief engineers who have done good service.

The new scale of pay takes effect from the 1st of January 1905, and it is to be hoped that the better prospects thus held out may attract young Egyptians, of the kind required, to take up the profession of engineering and enter the Polytechnic School.

THE IRRIGATION STAFF IN 1904.

The results of last year's work bear ample testimony to the good work done by the members of the Irrigation, one and all.

The names of those specially selected for mention will be found in the reports of the two Inspectors General of Irrigation. As for the Inspectors General themselves, Messrs. Webb and Verschoyle, their work speaks for them far more eloquently than any words of mine would do.

In consequence of the formation of the Soudan Irrigation Service several changes were entailed in the distribution of the appointments.

Mr. Dupuis, Inspector of Irrigation in the 2nd Circle was appointed Inspector General of Irrigation in the Soudan, with Messrs. Tottenham and Walsh as his assistants.

Mr. Ireland was appointed Inspector of the newly created Zifta Circle.

Part II.—WORKS OTHER THAN IRRIGATION.

I.—THE TOWNS AND BUILDINGS SERVICE.

Mr. Perry, the Director General of this branch of the Public Works Department, has, as usual, administered it in a satisfactory manner. He is a most energetic and capable chief, and his staff has, on the whole, responded well to the calls which he has made upon it. In his attached report, Mr. Perry mentions the names of those of his officers whom he considers deserving of special credit for the good work which they have done during the past year. I endorse his words of praise regarding each one of them.

Mr. Perry's report is a very long one, and contains an immense amount of matter. The only criticism I have to make regarding it is, that it consists of little else but tables of statistics. Now these are no doubt necessary—although I think some of them might have been omitted with advantage—but, in order to render a report interesting to the general public, something, besides bare statistics, is necessary. The work carried out by Mr. Perry is so considerable and so varied, and the difficulties which he has to contend against are so many, that they merit rather more description than he has given to them. I hope that next year he will devote more space to a description of his work and will perhaps omit some of his tables.

The following figures show the sums expended by the Towns and Buildings Service in 1904:—

	L.E.	M.
(a) Ordinary Budget... ..	220473	100
(b) Special funds granted by the Caisse	127437	009
(c) Special funds from other Departments... ..	11342	724
(d) Special works carried out under "Reserve"... ..	77178	150
(e) Special works carried out under "Revenue"	13405	565
Total... ..	<u>L.E. 449836</u>	<u>548</u>

This total shows an increase over that of 1903 amounting to L.E. 72518.751 Mill.

The first items in the first table are thus subdivided:—

(a) ORDINARY BUDGET.

	L.E.	M.
(1) General Direction	22306	756
(2) Public Buildings	77736	370
(3) Cairo City	30609	217
(4) Provincial towns	53839	513
(5) Gas	26699	940
(6) Esbekieh Gardens	2483	960
(7) Miscellaneous	6797	344
Total... ..	<u>L.E. 220473</u>	<u>100</u>

This total exceeds that for the previous year by L.E. 7443.842 Mill.
I will briefly discuss the different items:—

(1) General Direction.

This calls for no special remarks. The sum represents the salaries of the permanent staff, and the increase — over 1903 — is only L.E. 159.985 Mill.

(2) Public Buildings.

The following is the distribution of expenditure:—

	L.E.	M.
Temporary staff	817	894
General charges	5129	126
Materials and plant	607	348
New works	14965	635
Repairs and maintenance	56216	370
Total... ..	<u>L.E. 77736</u>	<u>370</u>

or less than the expenditure in the previous year by L.E. 7829.280 Mill.

The above does not include the buildings constructed under special grants.

(3) Cairo City.

	L.E.	M.
Temporary staff	728	613
General charges	875	860
Materials and plant	1466	030
Transport and rolling stock	8302	248
New works	1853	686
Repairs and maintenance	17382	780
Total... ..	<u>L.E. 30609</u>	<u>217</u>

or less than the expenditure for 1903, by L.E.2628.274 Mill.

(4) *Provincial Towns.*

									L.E.	M.
Temporary staff	...	...	...	...	...	...	...	...	849	493
General charges	...	...	...	...	...	...	...	...	1098	705
Materials and plant	...	...	...	...	...	...	...	...	21	140
New works	...	...	...	...	...	...	...	...	46	383
Repairs and maintenance	...	...	...	...	...	...	...	...	51823	792
Total... ..									L.E. 53839	513

This is an increase over last year's expenditure equal to L.E.5454.513 Mill.

These sums are expended by the Local Committees of the provincial towns. These again are controlled by a permanent Superior Commission at Cairo, which examines all proposed expenditure exceeding a certain fixed amount.

M. Perry criticises the work done by the local committees on the whole unfavourably. He considers that they endeavour first to attain independence from control, and place efficiency in the second rank of importance. Doubtless this is so to a certain extent, but, with time, it is to be hoped that improvement will result. A great deal of good work is being done, and the principle of interesting the inhabitants of these towns in their own improvements, and giving them a voice regarding the expenditure, is a sound one. In everything but unimportant projects, moreover, they are controlled by the Superior Committee.

(5) *Gas and lighting of Cairo.*

(a) *Gas.* 311 new lamps were added in 1904, at a cost of some L.E. 2400. This brings the total up to 3813. This figure is hardly half of that required for the effective lighting of the city, and up to the end of 1904, the high rate charged for gas by the Company necessitated the suspension of any further extension. In the early days of 1905, however, responsible delegates of the Company visited Egypt, and treated direct with the Government. The result has been satisfactory for both parties. The rate for gas has been reduced, an extension of the area has been granted to the Company, and many of the obscure points in the original concession have been recast and made clear.

3252 lamps were fitted with incandescent burners in 1904—the results have been good.

(b) *Electricity.*

81313 lamps (representing 1843 private consumers) were connected in 1904, also 141 arc lamps.

1765 metres of high-tension, and 5539 metres of low-tension cable were laid in 1904.

The number of lamps is rapidly increasing. The demand for the current has increased far more rapidly than was expected, and although the generating station was enlarged last year, it has already worked to its full capacity, and the Company will be obliged to erect a new generating set next year.

I regret that it was found impossible to obtain any reduction in the price of electricity for private individuals, when altering the convention, at the commencement of this year. The present rate is very high, but the Company protests that it is at present unable to reduce it. The existing rate, however, has only been fixed for a period of five years, and I hope that, by that time, it may be found possible to reduce the charges made to the public.

The towns of Helwan, Mansoura, Suez, Port-Tewfik, Port-Said, Ismailia and Tantah are now lighted by electricity.

(6) *The Ezbekieh Gardens.*

These call for no very special remarks, but I differ from Mr. Perry in one respect. He wishes to keep these gardens closed, and not permit them to be used for fêtes, etc. Upon the latter point he may be right, but I wish to see these gardens thrown open to the public free of charge, and made into a public park.

(7) *Miscellaneous expenditure.*

This, like the above, calls for no special remarks. It is made up of a lot small charges, which will be found detailed in Mr. Perry's tables.

I now come to item (b) in the first table of expenditure, viz. expenditure under special credits granted by the Caisse de la Dette.

The expenditure is detailed as follows :

	L. E.	M.
I. New Egyptological Museum	7272	224
II. Asphaltic paving Cairo streets	11770	464
III. Repairs to ancient monuments	5092	587
IV. New Nile bridges	9214	627
V. Sundry new buildings	94087	107
Total	L. E. 127437	009

I will say a few words regarding the above :

I. The expenditure on the Museum, represents the clearing of the façade, the painting of the interior, and alterations to the lighting of the building.

II. 17035 square metres of street were asphalted last year.

III. The repairs to ancient monuments are carried out by a special committee which publishes a special report annually. The work, although the sum is entered in Mr. Perry's budget, does not come under his control.

IV. The new Nile bridges.

34 projects were received for these works. The design eventually selected was that of Sir William Arrol & Co.

The date of commencing the work—according to the contract—was the 1st of December 1904. Previous to that date, a good deal of preparatory work was done, in the way of road making, and staging for the new bridge across the river. There are three bridges : one across the Nile, and two across what is known as the Roda Island channel.

V. I now come to the last item, viz New Buildings. I will not, however, in my note, separate those buildings for which money was granted by the Caisse from those for which funds were supplied from other sources, viz. as b, c, d and e, in the table of expenditure.

Mr. Perry, in his report, gives lists of all the buildings under construction, together with the expenditure incurred upon each and a brief account of the state of the work at the end of last year. I need in consequence do no more than mention a few of the more important works which were carried out last year.

These were : the Polytechnic School Cairo, the Zagazig and Asyut Mudirihs, the Model Workshop at Asyut, the Military Hospital at Abbassieh, the Cairo Central Fire Station, and the Cairo Girls' School. In addition to these, many smaller buildings, such as Police barracks, tribunals, provincial schools, etc., etc., were constructed, or are under construction, in the provinces.

Repairs and maintenance of buildings.

L.E. 65,577 were spent on this head in 1904, but, in reality, this sum is subject to so many deductions that it does not at all represent the actual expenditure upon repairs. Mr. Perry estimates that in order to keep the existing buildings in thorough repair, a sum of L.E. 156,000 per annum is necessary. Such a large increase cannot at

present be granted, but the budget for 1905 has been increased (under this head) by more than L.E. 27,000, which ought to assist Mr. Perry materially in keeping the Government buildings in an efficient state of repair.

CAIRO ROADS.

The total area of road surface is 2,872,534 square metres, of which only 17 % are at present either macadamised or paved.

The areas maintained in 1904 were:—

Macadam	...	...	...	...	...	469412 square metres
Asphalte	...	...	...	...	...	19643 " "

A considerable addition has been allowed in the Road Budget for 1905—the total increase for Cairo City being L.E. 33,063.

A further sum of L.E. 20,000 has been allowed for continuing the paving of certain streets in the native quarters with asphalte.

At present only those streets which are provided with storm-water drains are being undertaken. A project has been prepared for draining a large area of the city. Work will be commenced in 1905. The total estimate amounts to L.E. 120,000, and the work will take three years to complete.

CAIRO TRAMWAYS.

The total length of line now open for traffic is 47,716 metres.

The number of passengers making use of these tramways is steadily increasing, the daily average for 1904 being 69,416, as against 52,672 in 1903—an increase of about 33 per cent.

Nine fatal, five serious, and ninety-one slight accidents occurred in the tramways in 1904—not a large number if the number of people travelling by these lines be taken into account.

MISCELLANEOUS.

There are two other notes contained in Mr. Perry's report to which I would draw attention as being of special interest. The one is the account of the removal of a large rock which threatened the mosque of El-Magrani at Cairo, and the other describes the failure of the béton armé in the roof of the Quarantine Park at Mex.

Both these notes will repay perusal.

II.—THE SURVEY DEPARTMENT.

The following table shows the expenditure for last year :—

	L.E.	M.
Permanent staff	10749	620
General charges	44271	889
Geological survey	2877	547
Measurements of the White and Blue Niles	100	000
Reproduction of maps	1539	442
General survey	9899	965
Total	<u>L.E.68538</u>	<u>463</u>

The expenditure for 1904 exceeds that for the previous year by L.E. 5,796,111. The increase is due to the increased allotment made by the Ministry of Finance for the Revenue Survey.

MAPPING DEPARTMENT.

The sale of maps and publications has steadily increased:—

YEAR	AMOUNT REALIZED BY SALES
	L.E.
1901	801
1902	1011
1903	1721
1904	2809

The map store is being enlarged, and a sale room—where applicants can consult maps—being constructed.

REVENUE SURVEY.

The work of the staff was concentrated in the provinces of Aswan, Kena and Girga during 1904.

In Aswan 101,000 feddans were surveyed, and the maps and records completed.

In Kena the figure was 181,500 feddans.

In Girga Province 294,000 feddans were surveyed in the field, and 10,000 feddans were completed—as regards records—by the end of last year.

This represents a good year's work, although rather lower than that of 1903. 219 villages were completed as regards both maps and records in 1904.

MAJOR TRIANGULATION.

During the year, the major triangulation has been completed for a portion of Aswan, for the whole of Asyut, for all Minia and all Beni-Souef.

This triangulation depends upon ten bases, at intervals of about one hundred kilometres apart, and its absolute position depends upon two fundamental latitudes and longitudes at Abbassia and Luxor—and upon check observations at the other base-lines.

4,950 square kilometres were completed in 1904 at a cost of L.E. 2,181.

MINOR TRIANGULATION.

4,430 square kilometres were triangulated at a cost of L.E. 2,072.

COMPUTATIONS.

652,977 feddans were computed comprising 53,942 grants, and a length of lines equal to 13,686 kilometres. 423 villages were also computed, the total cost being L.E. 2,325.

METEOROLOGICAL STATIONS.

A new station was equipped at Roseires in 1904, and an arrangement was made with the Soudan Government by which several others should be brought up to the level of second-class stations.

A separate report of the work done by this very important branch of the Service is now published annually.

GEOLOGICAL SURVEY.

A considerable amount of work was done in the Geological Museum last year, in the shape of arranging and classifying the fossils and minerals and in mounting the more important ones under glass cases.

Mr. Barron, an officer of this Service, has been lent to the Soudan Government for work in that country.

CAIRO OBSERVATORY.

This was transferred from the old station at Abbassieh to new buildings, specially constructed for the purpose, at Heloman. The

transport was effected in such a way that no interruption was made in the continuity of the work.

Captain Lyons, in his attached report, gives a very interesting account of the work carried out at this observatory. It will be seen from this how important are its functions and how large a range is covered by the observations made.

Captain Lyons has gradually collected a very perfect set of instruments at the observatory, and the completeness of this collection has been increased by the gift of a fine reflector of 30 inches diameter generously presented to the Egyptian Government by Mr. J. H. Reynolds. With the help of this instrument, valuable additions to our astronomical knowledge may be expected.

THE LABORATORY.

A great deal of very useful work has been done by Mr. Lucas, the analytical chemist attached to the Survey Department.

497 samples were examined and tested comprising over minerals, building stones, cements, lines, etc.

Elaborate tests of the gas supplied by the Gas Company in Cairo were also made, and tests were held during 234 nights of last year.

THE STAFF OF THE SURVEY DEPARTMENT.

I have nothing but praise to accord to Captain Lyons for the manner in which he has controlled and administered the very important Service of which he is the head. He has collected round him a very able staff, composed mainly of highly-trained experts, and he has instituted a series of scientific observations which must prove of the highest value, not only to Egypt, but to the world. It has been decided that the Survey Department is, from beginning of 1905, to be transferred from the Ministry of Public Works to that of Finance, as a very large part of the work of the Service is connected with the Revenue Department. In all technical questions, however, Captain Lyons will work with this Ministry as before.

III.—THE TECHNICAL SERVICE.

Under the very able direction of Mohammed Pacha Anis, a high standard of efficiency has been maintained in this branch of the Ministry of Public Works.

The Service for the licensing and regulation of steam engines—under Mr. Crawley's supervision—made very satisfactory progress in the year just passed.

The difference between the conditions ruling at present—as regards steam engines licenses—and those of a few years ago, is very striking. Inspections are now made by the Government Inspectors with practically no trouble or obstruction on the part of engine proprietors, and applications for licenses come in regularly and voluntarily.

390 applications were made for licenses last year. These, with 96 which had remained over for consideration at the end of 1903—together with 18 received through the medium of the *Mudirialis*—make a total of 604 as against 458 in 1903.

Of the above, 441 licenses were granted last year—163 remaining over at the end of the year—for further consideration. 360 licensed engines passed all the required test satisfactorily and were permitted to be worked. The remaining 81 were still going through the test at the end of 1904.

There are now—on the 1st of January 1905—1649 engines employed for industrial purposes in Egypt (exclusive of those employed for irrigation), all of which are working in conformity with the Government regulations.

51 cases of “contravention” were brought before the Courts in 1904—48 in the Native, and 3 in the Mixed Courts. In these last, all the engines were stopped from working. Of the cases before the Native Courts, 10 engines were stopped, and the remaining 38 are still awaiting trial.

Anis Pacha reports that the Native Courts are extremely slow in trying cases of this kind—in some instances, a year and more elapsing before judgment is delivered. As it not infrequently happens that engines—pronounced to be in a dangerous state by the Government Inspector—are permitted to continue working until the case has been decided, such delays are very prejudicial to public security.

Only one boiler explosion took place in 1904. The cause was working it at a higher pressure than that authorized by the license. One man was killed. All Irrigation engine licenses are now granted by the Technical Service, and the boilers of such engines are now subjected to the same tests and regulations as the others.

Licenses for 15 "fixed" and 71 "portable" engines for irrigation, were granted last year. The sum realized amounting to L.E. 453.

QUARRY LICENSES.

Up to the end of last year, 563 quarry licenses have been granted by the Technical Service. Of these, 459 are for a period of ten years, six for five years only, and 97 were granted in perpetuity. These last date from many years back and perpetual licenses are never now granted.

56 licenses were given last year, the fees amounting to L.E. 3,960.

GOVERNMENT ARSENAL.

This establishment, which is excellently managed by Mr. Curtis, has, as usual, a good year's record to show of work done.

The value of work executed by the Arsenal in 1904 was L.E. 16,780. This is considerably less than the total for 1903, but the reduction is entirely due to the fact that the Irrigation Service—its chief customer—did not give orders on such a large scale last year, as is usually the case.

The expenditure is thus subdivided:—

	L.E.
work done for the Public Works Department ...	14,720
" " " other Government Administrations ...	1,680
" " " private individuals... ..	380

Materials, to the value of L.E. 11,260 were purchased last year. The issues amounted to L.E. 11,330.

The Government steamers were all kept in good repair. The cost of working them amounted to L.E. 5,660.

IV.—THE ANTIQUITIES SERVICE.

Monsieur Maspéro, the Director of this Service, has written a long and extremely interesting report upon the working of this Service in 1904. I will only make a few brief extracts from it, but I recommend its perusal to all interested in Egyptology.

Monsieur Maspéro's name stands so high that any word of mine in his praise must be superfluous. I will only then congratulate him and his staff, for the excellent results of their last year's work.

The restoration of the Karnak Temples proceeded rapidly and well in 1904. The whole of the eleven columns of the great Hall which collapsed in 1899, have now been built to their full height—each separate stone occupying its exact former position—and it only now remains to place the capitals and architraves upon the top. In this part of the work, *béton armé* will probably be made large use of, in order to avoid overloading the restored columns.

The work connected with the general restoration of these temples brought to light—at the south end of the Hypostyle Hall—a find of statues of unparalleled interest. A pit was here discovered, into which the architects who—during the reign of the Earlier Ptolemies in the third century before Christ—restored these temples, had buried a very large number of statues taken from the buildings connected with the residence of the High Priests of Ammon.

In 1904, some five hundred statues were disinterred from this pit, and this by no means exhausted the number, as the work has been continued with successful results throughout the early summer months of 1905. These statues—all of which have been transported to the Museum of Cairo—represent in many instances the very highest types known of ancient Egyptian art.

Great credit is due to Monsieur Legrain, who has been in charge of the restoration of these temples, since the commencement of the work, both for the very skilful manner in which he has rebuilt the columns, without accident or damage to a single stone, and also for the energy and keenness which have led to the successful disinterment of this magnificent collection of statues. Nothing like the present find has been made since Mariette Pasha's excavations at the Serapeum. The historical value of these statues is immense. Many other works connected with the restoration and excavations of the Upper Egypt monuments were carried out last year; among these may be mentioned the rebuilding of those portions of the Komoubo Temples which fell down, and also of the great wall on the west side of the Edfou Temple. This wall collapsed, and serious fears—happily now averted—were entertained for the safety of the roofing of the temple itself. Both these works were carried out by M. Barsanti.

All the latest accounts regarding the state of the submerged monuments at Philæ, are satisfactory, as far as they go. In Lord Cromer's report for last year, there appeared a note from Monsieur Maspéro couched in the following words :

“ Je suis heureux de constater que l'état de Philæ est de plus en plus ”
“ satisfaisant. Le gré, au milieu de se décomposer sous l'influence de ”

" l'eau, comme on pouvait le craindre, s'est raffermi et endurci : il a "
" plus de consistance, et, par conséquent, plus de chances de durée "
" qu'auparavant. Toute crainte n'est pas écartée encore, en ce qui "
" concerne l'action du salpêtre et des matières organiques dont la pierre "
" s'est imprégnée pendant le temps que les édifices furent habités par "
" les fellahs. Toutefois les indices recueillis à ce propos sont des plus "
" rassurants et nous avons tout lieu d'espérer que l'expérience des "
" années qui viendront confirmera la bonne impression que nous laisse "
" celle des deux années écoulées. "

Since writing the above, Monsieur Maspéro has again visited these monuments, and has had them examined by Monsieur R. Fourtau, a member of the Egyptian Institute, and himself an engineer and geologist of well-known capacity.

Monsieur Fourtau has written a long and interesting note upon the action of the water on the stonework of these temples, and concludes by saying :—

" En résumé, je suis persuadé que Philæ a plutôt gagné au point de "
" vue de la solidité des matériaux qui sont entrés dans la composition "
" de ses édifices, par suite du fait de son immersion sous les eaux du "
" réservoir, et que de simples précautions et un peu d'entretien après "
" son émergence suffiront à sa conservation. "

In his remarks upon Monsieur Fourtau's report, Monsieur Maspéro says :

" Il devient de plus en plus probable que les monuments de Philæ "
" pourront durer longtemps sans dommage appréciable dans les condi- "
" tions nouvelles où l'action du barrage les a placés. "

and again

" Ce que nous pouvons affirmer pour le moment, c'est que, si le pitto- "
" resque du site est perdu à jamais, les temples ont des chances de plus "
" en plus sérieuses de se maintenir. Ils survivront longtemps encore "
" aux alternatives de submersion et d'émergence partielles auxquelles ils "
" seront soumis désormais chaque année. "

Every one will rejoice to hear such favourable opinions regarding the safety of these historic ruins, expressed by two such competent authorities.

The general improvements in the arrangement of the collection in the New Cairo Museum have been continued. A statue and monument to Mariette Pasha were inaugurated in March 1904.

Good progress has been made with the painting of the interior of the building. This work is carried out by the Museum authorities from funds granted by the Public Works Department. It has been executed

economically and with good taste, and has materially improved the general effect.

Experiments in connection with the lighting of the building have been continued and, at last, a successful result seems to have been attained. The roof is not absolutely water-tight throughout, which is not suprising if the immense area covered by it—and the quantity of glass it contains—be taken into consideration. Steps are being taken to remedy this evil.

Good progress has been made with the compilation of the great catalogue. Eighteen volumes have been published. Seven others are in the press, and eight more are under preparation. It is hoped that—in about ten years' time—this work will be completed.

V.—AGRICULTURAL RAILWAYS.

Mr. Gunn, the Government Inspector of these lines, has presented his yearly report upon their working in 1904. I will make a few extracts from the more important portions of this note.

He reports a general improvement, both in receipts and in working, for the Light Railway lines in Lower Egypt. This is in spite of their having had to contend against the same difficulties as in 1903, namely, the cattle plague and the suppression of the annual fairs in the provinces.

I am sorry to say that no improvement is reported in the case of the Fayum Light Railways. Mr. Gunn states that the receipts have increased, but that the working of these lines is very bad, chiefly owing to the want of a competent manager.

The main complaint made against all the agricultural railways is the irregularity in the times of the arrival and departure of the trains. An improvement has been made in this direction, but there is still plenty of room for more.

The total length of lines now open for traffic in Lower Egypt, is 1122 kilometres. Only 42 kilometres were added last year; many extensions have been sanctioned, and work will—as soon as the detailed plans have been approved—be permitted to commence.

The goods tariffs have now been generally accepted and approved. In this respect, the facilities for navigation upon the main canals, now existing, have done good service to the public, in-as-much as the

competition thus caused has forced the companies to keep down their rates of transport.

The following are a few details regarding the working of the different companies in 1904:—

(I.) THE EGYPTIAN DELTA COMPANY.

There was an increase of the nett receipts last year—over that of 1903—amounting to L.E. 29,721.

The working expenses in 1904, show an increase of L.E.8,624 over those for 1903.

The following gives a comparison between the two last years:—

	1903	1904
	L. E.	L. E.
Gross receipts	129171	159102
Working expenses	80120	89041
Nett receipts	49051	70447
Proportion of working expenses to gross receipts ...	62.12%	55.94%

The gross receipts are subdivided as follows :

	1903	1904	Increase
	L. E.	L. E.	L. E.
Passengers	76937	90966	14029
Goods	47233	58224	10991
Sundries	4545	8941	4396
Télégraphs	750	1061	305
Totals... ..	129171	159192	29721

4,478,403 passengers were carried in 1904, as against 3,636,688 in 1903.

745,695 tons of goods were transported last year as against 471,530 tons in the year previous.

The total length of running track is now 830 kilometres, or 516 miles.

Mr. Gunn reports a general improvement both in the alignment and the working of the lines managed by this company. Some locomotives

of a good type have been added, but the coaching stock is reported to be far from what it should be and many of the passenger carriages are quite unfit for the purpose required.

On the 19th of December last, this company amalgamated with the Helwan Railway Company and now works the two systems.

(II.) LA COMPAGNIE DE LA BASSE-ÉGYPTÉ.

This is a Belgian company, established for some years and working the lines between the town of Mansoura and Lake Menzaleh.

The following are the figures giving the comparison between 1903 and 1904.

	1903	1904
	L. E.	L. E.
Gross receipts	23091	22199
Working expenses	11381	11583
Nett receipts... ..	11710	14616
Proportion of gross receipts to working expenses ...	47%	44%

793733 passengers and 56274 tons of goods were conveyed by this railway in 1904, against 668344 passengers and 54642 tons of goods carried in 1903.

The company is well equipped and managed, and works the lines very economically. The stock is well maintained, but Mr. Gunn reports that the permanent way requires better supervision than it gets.

The total length of line in the hands of this company is only 109 kilometres.

The gauge is one metre, while that of both the Delta and Fayum Railways is only 0.75 metres.

(III.) THE FAYUM LIGHT RAILWAYS.

The following are the comparative figures for the two last years :

	1903	1904
	L. E.	L. E.
Gross receipts	18423	23840
Working expenses	13251	14000
Nett receipts	5173	9840
Proportion of working expenses to gross receipts ...	72%	60%

518,341 passengers and 144,670 tons of goods were carried last year, as against 478,853 passengers and 116,797 tons in 1903.

At first sight, these figures would seem to show that the company was making satisfactory progress, but the Government Inspector reports very unfavourably regarding the working of the lines. He says:—

“The staff appears to be entirely out of hand, and the traffic, and the”
“locomotive departments have been apparently left to run themselves.”

In Mr. Gunn's opinion, the increase in the receipts is entirely due to the great increase in the prosperity of the Fayum, and not to the successful working of the lines by the company.

It is very regrettable that this, the only purely Egyptian industrial enterprise in Egypt, should give cause to such strictures. It is to be feared that—in the interests of public safety—the Government will ere long be obliged to intervene. No railway can be safely run in the manner that Mr. Gunn reports this one to be run, and unless the company takes heed to its ways, and appoint a competent and sufficient working staff—at the same time maintaining its rolling stock and permanent way in an efficient state—dangerous accidents are almost certain to occur. The company has been warned more than once, and I repeat that—unless the necessary changes are carried out in the near future—the Government will be forced to intervene, however reluctant it may be to take such a step.

VI.—THE CAIRO ZOOLOGICAL GARDENS.

Under the very able direction of Captain Stanley Flower, the record for last year is a very satisfactory one for these gardens.

The number of visitors was the highest on record, being 64,711, while the gate-money amounted to L.E. 1,388.

A considerable number of new animals and birds were added to the collection—some having been purchased and more presented.

Among these may be mentioned a Chimpanzee, a Wild Ass, a Jackson's Hartebeeste, a Kudu and a Gazelle, while among the birds the most notable addition was a Sacred Ibis, presented by Dr. MacLaughlan of the American Mission, on the Sobat River.

A good deal was done in the way of improving the cages, and in housing the animals properly.

There are now in the gardens:—

Mammals	...	...	...	...	292	comprising	93	species
Birds	...	...	...	...	575	"	133	"
Reptiles	...	...	...	...	103	"	33	"
Batrachians	...	...	...	...	2	"	1	"
Total	...	...	...	...	<u>972</u>	<u>comprising</u>	<u>260</u>	<u>species</u>

A Giraffe and an Ant-Bear died in 1904, and in all there were 267 deaths.

The two Indian Elephants were disposed of and sent to Europe. It is intended to replace them by the African species.

The total receipts in 1904 were	L. E. 4868,665
„ „ expenditures „ „	4678,817
Balance	L. E. 189,848

From the 1st January 1905, the entrance money has been reduced (Sundays excepted) from 2 Piastres to half a Piastre. So far, this reduction has caused no diminution whatever in the receipts.

THE GHEZIREH AQUARIUM.

This establishment also is under the superintendence of Captain Flower. It contains twenty-nine varieties of Nile fish, some of the varieties having never before been kept alive in captivity. This aquarium is well worth a visit, but somehow does not seem to attract the public. The gardens are beautiful, and the collection of fish very interesting, but the total receipts are insignificant. It is intended to reduce the rate of entrance in 1905, but it is doubtful whether even this will attract the native public.

VII.—THE PUBLIC WORKS STAFF IN 1904.

At the end of last year, certain important changes in the administrative staff were decided upon.

In consequence of my having been appointed Adviser to the Ministry of Public Works, and of the overwhelming increase which has resulted in the administrative work during the last few years, it was decided, from the 1st of January 1905, to appoint two new Under Secretaries of State—one for Irrigation in Egypt, and the other for Towns and Buildings. In this way the service has been further de-centralized and the Adviser has been relieved of a large amount of correspondence and detail work. To the former post, Mr. A. L. Webb, Inspector General of Irrigation in Upper Egypt, was appointed, and to the latter, Mr. A. H. Perry, the Director General of Towns and Buildings.

To fill the post left vacant by Mr. Webb, Mr. T. Clowes was appointed Inspector General of Irrigation in Upper Egypt, while Mr. Ireland

was appointed Inspector of the 4th Circle of Irrigation, Mr. Finlaison taking his place in the Zifta Circle, he in his turn being replaced at the Barrage by Mr. Molesworth. I have already alluded to Messrs. Dupuis, Tottenham and Walsh having been transferred to the Soudan.

The entire administrative staff of the Ministry worked hard and well in 1904. Monsieur Boinet Bey, the Secrétaire Général, rendered me extremely valuable assistance, and Monsieur Farid Bey Babazogli managed the office with exceptional zeal and ability.

W. E. GARSTIN.

Adviser to the Ministry of Public Works.

Cairo, June, 1905.

ADMINISTRATION REPORT
OF THE
IRRIGATION DEPARTMENT IN UPPER EGYPT

For 1904

BY

A. L. WEBB,

INSPECTOR GENERAL OF IRRIGATION UPPER EGYPT.

ADMINISTRATION REPORT OF THE IRRIGATION DEPARTMENT IN UPPER EGYPT FOR 1904.

Part I.—IRRIGATION AND DRAINAGE.

SECTION.—THE NILE.

It is customary to describe the state of the river during the various seasons by comparing the levels of the year under report with those of the previous one, or of some special year of high or low readings.

As explained in last year's report, owing to the construction of the Aswan Dam, and the effect of the working of the sluices on the Aswan gauge, it is necessary to take the levels of the Halfa gauge of the winter and summer months, in order to make a comparison with previous years.

*Halfa gauge. (winter and summer supply).—*The following statement gives the reading of this gauge on the 1st and 15th of each month, omitting the flood months of July to October. Vide Plate I.

YEAR	Nov.		Dec.		January.		February		March		April		May		June	
	1st	15th	1st	15th	1st	15th	1st	15th	1st	15th	1st	15th	1st	15th	1st	15th
1901	4.33	3.75	3.23	2.99												
1902					2.70	2.29	1.91	1.73	1.60	1.39	1.28	1.30	1.22	1.23	1.13	1.30
1902	1.60	3.92	3.37	3.10												
1903					2.80	2.58	2.20	1.84	1.60	1.42	1.22	1.10	1.00	1.00	0.98	1.65
1903	5.85	1.68	3.80	3.10												
1904					3.12	2.87	2.61	2.55	2.29	1.91	1.67	1.67	1.50	1.47	1.40	1.70
1904	4.22	3.77	3.38	3.01												

From the above it will be seen that the levels during the winter of 1903-04 (November to March) were considerably higher than those of 1902-03, and continued to be so during April, May and the first half of June 1904.

The minimum levels registered at Halfa were :

In 1902 1·13 from 30th May to 2nd June.

In 1903 0·95 on 21st May.

In 1904 1·35 from 28th to 30th May.

The levels in November and December 1904, as shown above, are considerably lower than those of 1903 in the same months, and are even worse than the exceptionally low levels of the winter of 1902. Consequently the prospects for 1905 are worse than those for the year under review.

Aswan gauge. (Flood months). Vide Plate II.— At the beginning of July the Aswan Reservoir was empty, and the river passing freely through the sluices of the dam. The rise of the flood was late, and was first felt at Aswan on the 14th July, with a level of R. L. 85. 80, which is 1·17 metres lower than the mean (86·97) of 30 years for that date.

During July the rise was fairly normal and continued up to 13th August, when 14 Pies 11 Kirats (R. L. 91·96) was recorded, being the maximum level of the whole Flood. From the 13th August it fell rapidly till the end of the month: then rose and fell alternately till the 14th September, after which date it fell rapidly till the end of October.

During the second half of August, and the whole of September and October, it was considerably below the Mean of 30 years and must be classed as a very bad flood.

Summing up the observations at Halfa and Aswan we have the following :

- (a) During the winter months the levels were high.
- (b) During the Summer months they continued fairly high till the middle of June, when there was a falling off.
- (c) The rise of the flood was late and poor. During the second half of August, all September and October, the levels were very low.

The flood was bad throughout and the levels at the end of the year give promise of a poor summer supply in 1905.

At Assiut.—The following statement shows the daily gauge readings at the head of the Ibrahimiyah canal during the Summer months of 1904, and in typical years.

HEAD OF IBRAHIMIYAH CANAL.

YEAR.	AVERAGE GAUGE-READINGS AT ASYUT DURING				Nature of summer levels and observations.
	April.	May.	June.	July.	
1889...	44.99	44.75	44.57	45.60	Very Low
1899...	46.50	45.91	45.47	46.52	High
1902...	46.24	46.26	46.15	46.46	Regulation first made on the Asyut Barrage.
1903...	46.70	46.53	46.60	47.55	Aswan Reservoir first used for giving supplementary supply.
1904...	47.17	46.83	47.01	47.50	

N.B.—The Asyut converted basins first received summer water in 1902.

The South Minia converted basins " " " 1903.

The North " " " " " 1901.

Owing to the regulation on the Assiut Barrage, and the supplementary supply in the river from the Aswan Reservoir, and also because of a good summer river, as shown by the Halfa gauge, the levels at the head of the Ibrahimiyah Canal were the highest on record. The steadily improving gauge readings during the last three years were required to meet the increasing area under summer irrigation, as the work of conversion of the basins progressed.

The rise of the flood reached Assiut on 23rd July, and continued steadily till 15th August, after which date it behaved similarly to that at Aswan. The maximum reached was R.L. 51.13 on 17th and 18th September.

It may be noted that a level of 51.00 is required to give full flood discharge in the Ibrahimiyah Canal for the area under command, but in 1904 this was only attained from 13th to 19th August, 15th to 20th September and 27th to 29th September.

SECTION II.—SUMMER IRRIGATION

The volumes entering and utilized in the Ibrahimiyah Canal during the summer months of the last four years, and the very low year 1889 and the high year 1899, are given below in cubic metres per second, together with the dates of the complete closure of the Deirut Escape.

YEAR.	APRIL.		MAY.		JUNE.		Date of complete closure of the Deirut Escape.
	Discharge at head.	Discharge utilized.	Discharge at head.	Discharge utilized.	Discharge at head.	Discharge utilized.	
1889	37.1	37.1	32.5	32.5	26.4	26.4	15th Feb. very low river.
1899	115.1	96.5	123.5	118.4	83.0	83.0	1st June, high "
1901	48.4	48.4	55.5	55.5	64.6	64.6	18th Feb. low "
1902	82.8	54.6	101.5	64.7	106.7	66.2	Variable.
1903	117.7	117.7	101.8	101.8	124.3	124.3	15th February Aswan Reservoir first used.
1904	148.0	148.0	118.0	118.0	129.0	129.0	19th January.

N.B.—In 1902 regulation was first made on the Assiut Barrage, and in that year also regulation was made at Deirut for the benefit of Lower Egypt, as the discharge entering the head of the Ibrahimiyah Canal was in excess of the proportionate share for Middle Egypt.

The discharge utilized varies with the discharge available, and after the complete closure of the Deirut Escape, the whole of the available discharge is utilized.

From the above statement it will be seen that the supply available and utilized was excellent throughout the three summer months. The result was to ease the rotations in the old perennial area, to give water to the converted basins of Asyut and Minia and to give the Fayum its required supply.

Supplementary supply from the Aswan Reservoir.—As stated in last year's report the requirements of Middle Egypt, commanded by the Ibrahimiyah Canal and the Yusufi for the Fayum, were fixed at 9½ million. To this was added an extra half million in 1904 for the extra area of the six Northern basins of the Minia Province, which were ready to receive Sefi water for the first time in the summer of 1904.

In order to meet the required supply of 10 millions, a supplementary supply was given from the Aswan Reservoir from 15th May to 29th June.

Fayum supply.—Owing to water being escaped from the Salakhah Canal into the Bahr Yusuf at intermittent periods, the regulation at Lahm caused some trouble. This, however, will be remedied in future by the construction of the Giza Canal.

The Sefi area of 1904 in the Fayum Province was 115,000 feddans requiring a supply of 3,450,000 cubic metres per day : the average discharge was as follows :

Bahr Yusuf below Lahun	2,085,622	cubic metres per day
Hassan Wasif Canal	890,583	" " "
Total... ..	<u>2,976,205</u>	" " "

which is less than the required discharge. Owing, however, to remodelling works, some of the larger canals were alternately shut down, so that in reality the discharge proved sufficient.

Rotations.—Rotations were commenced on the Ibrahimiyah Canal and branches from 1st May, and were continued until about 20th July ; they were the same as given in last year's report. Owing to the high river and the supplementary supply from the Aswan Reservoir, it was found necessary only to enforce the first class of rotations.

In 1904 the whole of the Minia converted basins received Sefi water, so that, for the first time, the entire set of canals depending on the Sabakhah Canal system was worked for summer supply. The whole system was divided into 3 groups, and the period of rotation was 18 days, consisting of 6 days working and 12 days without water for each group : this seems to have worked satisfactorily.

In the Fayum, rotations were worked on the heads of the two main canals at Lahun, but, owing to remodelling works in some of the canals, the system was not sufficiently tested.

The cotton crop.—The areas under cotton irrigated by the Ibrahimiyah canal and its branches in the past five years are as follows :—

1900... ..	92,842	Feddans.
1901... ..	105,750	"
1902... ..	95,356	"
1903... ..	153,000	"
1904... ..	250,205	"

showing an increase of 97,205 feddans over the previous year : besides the above, 8376 feddan were irrigated from wells in the Beni-Suef Province.

The following statement, kindly furnished by Mr. F. Wakham, Agent of Messrs. Carver Bros, in Upper Egypt, shows the outturn of the Ginning Factories in the different Provinces during the past five seasons :

SEASON.	Asyut.	Minia.	Beni Suef.	Fayum.	TOTAL.	Average price per kantar.
	kantars.	kantars.	kantars.	kantars.	kantars.	P. T.
1900-1901	Nil.	104,000	131,000	130,000	365,000	275
1901-1902	Nil.	128,000	174,000	130,000	432,000	205
1902-1903	Nil.	161,650	164,500	145,000	471,150	275
1903-1904		295,000	235,000	235,000	765,000	325
1904-1905		610,000	260,000	240,000	1,110,000	265

The outturn of 1904-05 shows an increase of 45% over that of the previous year, while the increase in area under cotton cultivation is 63% : the difference is probably due to the inferior crop.

The following statement gives the area of feddans of cotton in the difference provinces irrigated by the Ibrahimiyah Canal and its branches during the past five years :—

YEAR.	Asyut.	Minia.	Beni Suef.	Fayum.	TOTAL.
1900 ...	2,753	27,912	26,086	36,091	92,842
1901 ...	3,361	26,599	28,177	47,643	105,780
1902 ...	1,824	26,085	27,103	40,344	95,356
1903 ...	8,349	54,527	31,872	58,251	153,002
1904 ...	30,799	92,918	36,458	90,000	250,205

There is a large increase in each province except Beni Suef, where it is only 5000 Feddans.

Besides the above, 2,885 feddans were irrigated from the Nile direct in Minia Province and 1,170 in Beni Suef.

In Beni Suef also there were 8376 feddans irrigated by wells in the basins.

Sugar cane.—The following statement gives the quantities of cane crushed in the chief factories in Upper Egypt and the outturn of No. 1 Sugar during the past six seasons :—

SEASON.	DAIRA SANIEN			DAIRA SULTAN PASHA.			SOCIÉTÉ GÉNÉRALE DES SUCRERIES DE LA HAUTE-ÉGYPTÉ.			EGYPTIAN SUGAR AND LAND COMPANY		
	Cane crushed	Outturn No. 1 Sugar	Percentage	Cane crushed	Outturn No. 1 Sugar	Percentage	Cane crushed	Outturn No. 1 Sugar	Percentage	Cane crushed	Outturn No. 1 Sugar	Percentage
	Kantars	Kantars		Kantars	Kantars		Kantars	Kantars		Kantars	Kantars	
1899-1900.	14,515,565	1,340,955	9.1	404,021	42,059	9.2	5,074,871	575,409	9.6	501,536	10,609	9.2
1900-1901.	11,850,483	1,161,471	9.09	554,166	42,460	9.04	6,908,772	682,587	9.58	650,500	61,910	9.06
1901-1902.	12,442,452	1,245,843	10.01	410,463	40,550	9.75	7,653,549	642,513	8.40	—	—	—
1902-1903.	11,148,491	1,028,103	9.2	565,931	46,892	8.29	8,604,787	795,585	9.2	—	—	—
1903-1904.	—	—	—	354,758	37,099	9.04	14,650,460	1,329,455	9.34	—	—	—
1904-1905.	—	—	—	290,380	10,650	7.79	11,743,511	1,014,682	8.64	—	—	—

The total number of kantars crushed and the total outturn of No. 1 Sugar for each of the six years included in the statement are as follows:—

SEASON.	Cane crushed.	Outturn of No. 1 Sugar.
1899-1900	21,969,136	2,080,637
1900-1901	20,134,223	1,975,337
1901-1902	20,506,465	1,928,886
1902-1903	19,719,209	1,870,582
1903-1904	15,044,276	1,486,386
1904-1905	11,943,900	1,030,312

The following statement gives the area under sugar cane irrigated from the Ibrahimiyah Canal in the different provinces, during the past five years, and the areas grown south of Asyut irrigated by pumps and from wells:—

YEAR.	Asyut.	Minia.	Beni-Suef.	Fayum.	Total.	South of Asyut.	Grand Total.
1900 ...	8,052	22,139	5,670	458	36,319	17,440	53,759
1901 ...	12,780	28,413	6,282	618	48,093	14,522	62,615
1902 ...	10,519	28,904	5,725	799	45,947	15,091	61,038
1903 ...	8,646	25,430	4,072	669	38,817	14,853	53,670
1904 ...	14,110	18,000	3,975	800	36,885	15,427	52,312

The decrease in Middle Egypt is due to the increased area under cotton.

Sorghum or summer durah.—The total area of summer durah or “Qedi” planted in the basins was 92,569 feddans, which is about the average of the last five years.

Duty of water.—The total area of summer crops irrigated by the Ibrahimiyyah Canal, according to the figures furnished by the Chief Engineers, is shown in the following statement :—

Province.	Cotton.	Sugar Cane	Sefi Durah.	Other Crops.	Total.
Asyut	30,799	14,110	11,220	—	56,129
Minia	92,948	17,999	15,959	2,206	129,112
Beni Suef	36,458	3,975	2,282	1,819	44,534
Fayum	90,000	800	—	24,200	115,000
Totals... ..	250,205	36,884	29,461	28,225	344,775

In the above figures for Minia are included 5,056 feddans irrigated from the Bahr Yusuf, which must be deducted when dealing with the Ibrahimiyyah Canal discharges, thus the Minia area should be taken as 124,056 feddans, and similarly in Beni Suef an area of 10,855 feddans, was irrigated from the Bahr Yusuf, so that the Ibrahimiyyah area in Beni Suef will be 33,679 feddans.

The area irrigated by the Sabakhah canal in Minia Province is 52,357 feddans.

The mean and minimum discharges recorded during the year in the Ibrahimiyah and Yusufi Canals are as follows : —

CANAL.	Site	Mean discharge April to June c. metres per day.	Lowest recorded discharge c. metres per day.
1. Ibrahimiyah	Above Deirut ...	10,548,082	8,422,272
2. "	Below Deirut... ..	6,577,281	5,857,920
3. " " " " " "	" Maghagha ...	1,343,026	1,127,520
4. Bahr " Yusuf & Hassan Wassif... ..	" Lahun ...	2,976,205	1,234,112
5. Ibrahimiyah	From Deirut to Ma- ghagha	5,234,253	4,730,400
6. Sabakhah	At Head	2,061,691	1,246,752

N.B. No. 5 discharges are obtained by deducting No. 3 from No. 2.

Taking the areas in the different provinces we obtain the duty of water in each group, in cubic metres per day, per feddan irrigated, as follows :—

PROVINCE OR GROUP.	Total area of crops.	Duty on mean discharge.	Duty on minimum recorded discharge.
1. Asyut, Minia, Beni Suef & Fayum	344,775	30.30	24.42
2. Minia & Beni Suef together irrigated from Ibrahimiyah only	157,735	41.70	37.13
3. Beni Suef irrigated from Ibrahimiyah only	33,679	39.87	33.47
4. Fayum	115,000	25.87	10.73
5. Whole of Minia irrigated from Ibrahi- miyah & Sabakhah	129,112	40.54	36.63
6. Minia converted basins irrigated from Sa- bakhah	52,357	39.37	23.81

These duties are remarkably easy, due to the good supply available, except in the Fayum where the discharges were considerably reduced in May and June for the closure of certain canals in connection with the remodelling works : in fact, the true duty cannot be really ascertained in the Fayum under such conditions.

The mean discharge at the head of the Ibrahimiyah Canal was $10\frac{1}{2}$ millions and this gives a very fair duty of 30.30 cubic metres per feddan per day for the whole area under command in Middle Egypt and the Fayum.

SECTION III.—FLOOD IRRIGATION.

General character of flood.—In its early stages the flood promised well and rose rapidly until the 13th August, when it fell continuously till the 30th. During September it was bad, and in October was scarcely better. Owing to the fact that such a rapid fall took place just at the very time when the basin canals were opened, and that the levels never recovered themselves, the flood of 1904 must be classed as very low.

The following statement gives a comparison between the year 1904 and four previously very bad floods :—

AT ASWAN	GAUGES IN THE YEAR.				
	1877	1888	1899	1902	1904
	P.K.	P.K.	P.K.	P.K.	P.K.
Maximum	13.10	14.16	13.22	14.00	14.11
Colonel Ross' mean of 40 days 16th Aug. to 24th Sept. inclusive	12.23	13.22	13.00	12.14	13.14
Mean for irrigation on South of Sohag 11th Aug. to 4th Oct. inclusive	12.19	13.15	12.17	12.8	13.14
Mean for irrigation north of Sohag 10th Aug. to 20th Oct. inclusive	12.9	12.23	12.1	12.5	13.2

It will be seen that the flood of 1904 was better than the exceedingly low floods of 1877, 1888, 1899 and 1902, but still very low.

Owing to the very rapid fall after 13th August, the Public Works Ministry declared a bad flood, and instructions were issued to carry out the regulation of the basin irrigation in accordance with the rules laid down in previous bad floods.

Filling the basins.—Water was admitted to the basins of the different systems between 10th and 15th August ; throughout August the filling was far from satisfactory owing to the continuous fall of the river, and special precautions were taken to store up the water in selected basins as reservoirs. The filling was carried out in accordance with the experience gained from the manipulation of the low floods of 1899 and 1902, which has been described in the reports for those years.

The Inspectors have all submitted detailed reports from which it is evident that every possible means were taken to make the best use of the available water.

The following general remarks may be noted:—

Asiatic Province.—Nothing further can be done for the improvement of the irrigation in low floods, except the erection of pumping stations at the heads of the small canals of the different systems.

Kenah Province.—To fill the basins in a satisfactory manner, even in moderate floods, a barrage near Isna is absolutely necessary.

Girga Province.—Even in low years the filling of the basins can be carried out by careful regulation.

Asyut Province.—The filling of the basins is assured, even in low years, by the Sohagiyah Canal.

Minia Province.—(1) A gauge of R.L. 51.00 upstream of the Asyut Barrage is required to give full flood supply to all canals taking off at Deirut.

(2) A level of R.L. 46.40 to 46.50 is required in the Yusufi downstream of its head.

(3) With a level less than R.L. 31.90 in Yusufi downstream of Saqula regulator, the Abu Rahib escape of the Mohit drain works efficiently.

(4) With a level less than R.L. 29.20 in Yusufi downstream of Mazurah regulator the Mazurah escape of the Mohit drain works efficiently.

Beni Suef Province.—Owing to the conversion to the Sultani basin to perennial irrigation the filling of the Nina and Nucrah basins was very late, and, in fact, all the basins in this province had to wait the arrival of the “sarf” wave for their completion.

Supply to Yusufi sahels and hoshahs.—In order to run a low “sarf wave” in the Yusufi and thus allow the Abu Rahib and Mazurah escapes on the Mohit drain to work efficiently, hoshahs were constructed in the Minia Province on the sahels of the Yusufi. The result seems to have been satisfactory, but further improvements are required to eventually get a perfect low “sarf wave.”

Mr. Tottenham, who was in charge of the 4th Circle during the “sarf” has taken great pains to ascertain correct levels required, and his report on the subject will be useful for future regulation.

Discharge of the basins.—The dates of the commencement and completion of the “sarf” operations in the different systems are given below :—

SYSTEM.	SARF OPERATIONS.			
	Commencement		Completion	
	From	To	From	To
Ramadi	Oct. 3rd.	Oct. 17th.	Oct. 23rd.	Nov. 10th.
Killabiyah	Sept. 28th.	Oct. 1st.	Oct. 14th.	Oct. 19th.
Asfun	Oct. 1st.	Oct. 31st.	Oct. 18th.	Nov. 22nd.
Bayndiya	Oct. 5th.	Oct. 11th.	Oct. 20th.	Oct. 28th.
Shanhuriya	Oct. 3rd.	Oct. 21st.	Oct. 20th.	Oct. 28th.
Ghilasi	Oct. 5th.	Nov. 10th.	Oct. 19th.	Nov. 17th.
Fadiliya	Oct. 1st.	Nov. 26th.	Oct. 13th.	Nov. 30th.
Farshut	Oct. 8th.	Oct. 26th.	Oct. 16th.	Nov. 15th.
Khiyam	Sept. 30th.	Oct. 20th.	Oct. 16th.	Nov. 1st.
Akhmin	Oct. 7th.	Oct. 18th.	Oct. 16th.	Oct. 26th.
South Sohag	Oct. 6th.	Oct. 24th.	Oct. 12th.	Nov. 3rd.
North Sohag	Oct. 2nd.	Oct. 23rd.	Oct. 13th.	Nov. 1st.
do. (2nd Section)	Oct. 10th.	Oct. 16th.	Nov. 1st.	Nov. 12th.
Khizindariya	Sept. 29th.	Oct. 15th.	Oct. 19th.	Nov. 10th.
Asyut Delgawi	Oct. 1st.	Oct. 13th.	Oct. 20th.	Nov. 5th.
Delgawi-Kosheshah ...	Oct. 13th.	Nov. 1st.	Oct. 20th.	Nov. 20th.

The “sarf” operations were very similar to those of the low years 1899 and 1902 : they were exceedingly well carried out by the inspectors and their staffs.

Mr. Clowes, I.G.I., calls attention to the great delay caused in the discharge of hods Kosheshah and Riqqah owing to the supply required below Komi Regulator for the west Gizeh basins, and recommends that supplementary feeder heads be given to the hoshahs in order that they may be filled more rapidly. If this can be done, the heads should be made so as to be useful for perennial irrigation when the basin lands are converted a few years hence.

REGULATION BETWEEN CIRCLES.

5th Circle and Girga Directorate.—In years of low flood no water can be given by 5th Circle to Girga Directorate.

Girga Directorate and Asyut Barrage Directorate.—The new arrangement of regulating at Talihat, and the raising of the levels in hods Ziunar and Beni Suia in September by closing the Gebel Asyut bridge worked well, and should be adhered to in future.

Asyut Barrage Directorate and 4th Circle.—This only refers to the opening of the Delgawi escape and the maintenance of a gauge of R.L. 44.65 in the Yusufi downstream of the gauge.

4th Circle and Delta Barrage Directorate.—The same arrangement as in previous years was carried out, but the 4th Circle complains of the great delay in the "sarf" of the Beni Suef basins.

REGULATION AT DEIRUT AND IN YUSUFI.

Plate III shows the flood regulation in the Yusufi from Deirut to Lahm in August, September, October and part of November 1904. It will be seen from this how very late the basins Khosheshah and Riqa were filled, showing that there is very little water to spare over and above the Fayum requirements and the basins west of Yusufi in the Minia Province:

With the construction of the new Giza Canal from the Yusufi at Lahm it will be absolutely necessary that more water shall reach Lahm in August and September. This can be done as follows:

- (1) By regulation on the Asyut Barrage.
- (2) By retarding the filling of the basins on west of Yusufi.
- (3) By giving a supplementary supply from the Nile through the Bahabshin canal, which should be extended to the Bahr Yusuf.

REGULATION DURING FLOOD FOR DRAINAGE IN MIDDLE EGYPT.

The Asyut and Minia basins have now all been converted to perennial irrigation, and they are served, together with the old perennial area in those two Provinces, by the Muin Muhit drain, which has two escapes to the Nile at Etsa and Sharahna. During flood these escapes will not work, but pumps have been provided at Etsa, while the Sharahna Nile escape is replaced by two escapes from the Muhit drain at Abu Rahib and Maznrah to the Yusufi. These Yusufi escapes work well except during the time of the passing down of the "sarf" wave, about 20 days from the middle of October.

In order to have these escapes working continuously it is proposed to eventually run off the "sarf" at a low level, but until all works required for this purpose are completed, this is not possible: in the meantime, in order to give some assistance and to reduce the drain discharge to a minimum, rotations are worked on the branch canals of the Ibrahimiya.

A programme was drawn up, giving periods of 12 days of full flood levels and 6 days of low levels, and was enforced from the 12th September.

The result in Middle Egypt has been quite satisfactory, and a system of flood rotations should be annually enforced.

In the Fayum a somewhat different programme seems necessary in order to meet the demands of a large and increasing area of Rice crops: 8 days of full supply and 4 days of low supply will probably meet the case.

SHARAKI AREAS.

The areas resulting Sharaki and half Sharaki, as finally measured by the Finance Ministry, are shewn in Appendix N.

Compared with the low years 1877, 1888, 1899 and 1902 the results are as follows:—

YEAR	WHOLE SHARAKI
	Feldans.
1877	753,992
1888	269,110
1899	188,137
1902	128,663
1904	46,871

Considering the very low river levels during the filling of the basins, the comparatively small area of "sharaki" is very creditable to the irrigation staff who, during the wearisome periods of low levels and in the hottest months of the year in Upper Egypt, did most excellent work.

It is very satisfactory to note that they obtained every assistance from the Mudiriya Officials.

In the Aswan Province a considerable area has remained "sharaki" for several years; this, combined with the great loss of cattle from plague, has rendered many of the villages very poor. The only remedy would be the installation of pumping stations on the river, but this the villagers are too poor to do.

In the Kenh Province, out of the last six years, three have been very low, and large areas have remained "sharaki": in the other three years the flood irrigation has been far from satisfactory. This Province has received little benefit from Colonel Ross's works, and the recent irrigation works at Aswan and Asyut have not affected it; it has certainly a strong claim for consideration, and the most effective and rapid method of improving the Province is the construction of a Barrage at Isna to regulate the level of the flood.

The Girga Province has been saved by Colonel Ross' works.

The Provinces of Middle Egypt are secured by the Asyut Barrage, whilst the Delta is commanded by the Delta Barrages. In East Gizeh the Government has decided to convert the basins to perennial irrigation by means of pumps.

There only remains the Kenh Province which up to the present has scarcely benefited by irrigation works: the construction of the Isna Barrage is strongly advocated.

SHARAKI EXPENDITURE.

In making Hoshahs and other works for the prevention of sharaki the following expenditure was incurred;—

	L.E.
In 5th Circle	5,000
„ Girga Directorate	3,400
„ Asyut Barrage Directorate	1,817
„ 4th Circle	1,985
Total... ..	<u>L.E.12,202</u>

This was met by a Special Low Nile Credit granted by the Finance Ministry.

SECTION IV.—FLOOD WATCHMEN.

The total number of men called out was 13,788.

The average number of days they remained out was 65.

The total number of days labour was 896,220.

The following statement shows the distribution of the men in the different Circles.

In the projects circle the men were called out for the protection of the new canals and the banks of the Bahr Yusuf, in connection with the conversion works in the Minia and Beni Suef basins.

NUMBER OF CORVÉE MEN CALLED OUT DURING THE NILE FLOOD OF 1904.

CIRCLES AND PROVINCES.	NILE BANKS.				HABIA BANKS.				CASAB. BANKS.				BUTIRA.				ROBERTA.		TOTAL.
	Number of men called out.	Average number of days out.	Length of banks in kilometres.	Average number of men per kilometre.	Number of men called out.	Average number of days out.	Length of banks in kilometres.	Average number of men per kilometre.	Number of men called out.	Average number of days out.	Length of banks in kilometres.	Average number of men per kilometre.	Number of men called out.	Average number of days out.	Number of bullocks.	Average number of men per bullock.	Number of men called out.	Average number of days out.	
1ST CIRCLE.																			
Fayoum...	—	96	61	1	80	61	5	16	—	—	—	—	71	97	—	—	151	79	—
Bent Suez ...	310	54	33	3	590	33	132	4	81	30	76	—	178	29	—	—	1381	36	—
Mina ...	408	54	157	3	1017	42	193	5	18	31	18	—	143	63	35	1	1666	50	—
Ayut North ...	548	68	108	5	480	109	41	12	422	73	259	—	136	68	—	—	1586	80	—
Total ...	1256	—	—	—	2167	—	—	—	521	—	—	—	528	—	—	—	4781	61	—
PROVINCIA CIRCLE.																			
Mina ...	—	—	—	—	—	—	—	—	1729	92	—	—	—	—	—	—	1729	92	—
Bent Suez ...	—	—	—	—	—	—	—	—	1118	112	—	—	—	—	—	—	1118	112	—
Total ...	—	—	—	—	—	—	—	—	3177	—	—	—	—	—	—	—	3177	107	—
5TH CIRCLE.																			
Kena ...	174	36	81	2	303	35	103	2	139	25	81	2	355	38	102	2	921	31	—
Awan ...	—	—	—	—	—	—	—	—	—	—	—	—	359	43	16	3	359	43	—
Total ...	174	—	—	—	303	—	—	—	139	—	—	—	359	—	—	—	1010	31	—
GIZA DISTRICT.																			
Ayut South ...	171	55	91	2	94	61	58	2	111	59	58	2	150	72	58	3	359	61	—
Giza ...	220	68	232	1	615	44	297	2	956	37	512	—	337	61	298	2	2167	47	—
Total ...	431	—	—	—	709	—	—	—	1069	—	—	—	487	—	—	—	5726	109	—
ASYUT BARRAGE DISTRICT.																			
Ayut ...	293	—	—	—	597	—	—	—	421	—	—	—	—	—	—	—	2991	57	—
Grand Total ...	2151	—	—	—	1136	—	—	—	5327	—	—	—	1823	—	—	—	13788	65	—

SECTION V.—DRAINAGE.

All new drainage channels made during the year will be described under the head of "Special Works".

In the clearance of drains 376,369 cubic metres were executed at a cost of L.E. 5,380.

The Eisa pumping station was worked during the flood of 1904 for the second year since its completion. The working will be described under "Special Works." Next year it will be given over by the Projects Circle to the 4th Circle.

Levels of Lake Qarūn.—The following table gives the levels of Lake Qarūn on the 1st March for the past 20 years:—

YEAR.	Level of lake in metres below sea-level.	Fall in previous 12 months.	YEAR.	Level of lake in metres below sea-level.	Fall or rise in previous 12 months.
1886	40.00	0.20	1896	44.16	0.01 rise.
1887	40.38	0.38	1897	44.27	0.11 fall.
1888	40.73	0.35	1898	44.32	0.05 "
1889	41.47	0.74	1899	44.25	0.07 rise.
1890	42.00	0.53	1900	44.10	0.15 "
1891	42.78	0.78	1901	43.90	0.20 "
1892	43.32	0.54	1902	44.19	0.29 fall.
1893	43.78	0.46	1903	44.43	0.24 "
1894	43.84	0.06	1904	44.18	0.25 rise
1895	44.17	0.33	1905	43.77	0.41 "

Mr. Clowes, I.G.L., writes as follows:—

A new masonry gauge was constructed on the Lake shore during 1904. In levelling from Abuza to fix the zero of this new gauge it was found that the old gauge was 0.81 metres too high—thus minus 44.00 on the old gauge reads minus 44.81 on the new gauge.

The reading on the 1st March, 1905 as per the new gauge was minus 44.58; this has been converted to 43.77, and is so recorded in the table above, so as to make a comparison with the readings of past years of the old gauge.

Plate IV shows the lake levels from 1885 to 1896

" V " " " " " 1896 " 1900

" VI " " " " " " 1900 " 1904

These three diagrams complete the record of readings on the old gauge.

Part II.—SPECIAL WORKS.

(CHARGEABLE TO SPECIAL CAISSE CREDIT AND SPECIAL GRANT FROM ORDINARY BUDGET).

The sum available for expenditure on Special Works during the year was as follows:—

	L.E.
Special Caisse grant	549,973
Special grant from Ordinary Budget	35,370
Total	<u>L.E. 585,343</u>

The total expenditure was L. E. 522,474, leaving a balance of L.E. 62,869 to be carried forward for expenditure in 1905, principally on account of land expropriated, but not paid for, as the documents were not ready by the end of the year.

Appendix F gives a general abstract showing the distribution of the expenditure on the various projects, viz:

4th Circle.—

	L.E.
Fayum remodelling projects	62,015
Constructions of hoshahs on west of Yusufi-Minia	5,329
West Hafiz Gannabiyah—Land	2,226
Deirut escape repairs and remodelling	3,855
Improvements at head of Ibrahimiyah Canal	2,244
Wulidiyah syphon	1,746
Petty projects—land charges Asyut and Minia	614
Demarcation of land—Minia and Asyut	1,807
	<u>79,836</u>

Projects Circle.—

	L.E.
Conversion of Minia basins	126,170
Conversion of Hod Kom El Saaydah and Sultani	100,182
Remodelling Ibrahimiyah canal	122,299
Remodelling Muhit drain.	53,419
Etsa pumping station	5,807
Conversion of hods Nina and Nnerah... ..	4,859
Improvement of irrigation in hoshas Absug, Marco and Talt	621
Temporary establishment and contingencies..	18,449
	<u>431,806</u>

Girga Directorate.—

Irrigation masonry works	2,476
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5th Circle.—

Hod Hamad railway diversion and cost of land	1,856
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Aswan Reservoir.—

Projective Works	<u>6,500</u>
Grand Total	<u>L.E. 522,474</u>

The Appendices G and H give the details of the expenditure on the various Masonry Works, New channels and banks constructed, and existing channels remodelled during the year.

The following note gives the details of each project taken in hand or advanced during the year.

4TH CIRCLE.

Fayum Remodelling Projects.—The total expenditure on new works in the Fayum during 1904 was L.E. 62,232 of which L.E. 2514 was for Establishment and L.E. 59,718 for works.

The projects taken up on advanced were:—

Seilah Project.—Completion of 3rd reach of Abdalla Wahbi canal and branches. Branch drains serving lands irrigated by 3rd and 4th reaches of A. Wahbi canal in Tamiyah, Rodah and Rubiyat villages.

Remodelling Bahr Qohafa.—Owing to the conversion of Bahr Tamiyah into a drain, the Bahr Qohafa was remodelled throughout and now takes up the irrigation which was formerly on the head reach of Bahr Tamiyah.

Remodelling Bahr Gharak.—This canal has been enlarged from its head down to Abn Hamid bridge, the reach below to Tutun nasbah having been done in the previous year. The lower reach will be taken up in 1905 with the main branches.

Remodelling Bahr Tanhalla.—The head reach of the canal has been enlarged and straightened. A new road bridge with a short diversion of the canal has been made at El-Alam village. The Masara Duda nasbah has been rebuilt and the reach below it remodelled.

The expenditure was as follows:—

Canals or Drains.	Name of Project.	EXPENDITURE IN L.E.			Total.
		Land	Masonry works.	Earthwork.	
		L. E.	L. E.	L. E.	L. E.
Canals. {	Seilah	397	19,714	16,030	36,141
	Bahr Qohafa	—	404	900	1,304
	Bahr Gharak	—	2,933	9,000	11,933
	Bahr Tanhalla	—	2,628	2,380	5,008
	Total ...	397	25,678	28,310	54,386
Drains.	Seilah	—	5,102	230	5,332
	Grand Totals...	397	30,780	28,540	59,718

Hoshabs west of Yusufi.—In order to run a low "surf wave" in the Yusufi, hoshabs were constructed on the "Sahels," and iron pipes fixed in the tarrads for their irrigation. The reach from Nazlet El Abid to Saqah was completed and also a part of the next reach, down to Abu Rahib. They have been quite successful, and will finally be continued for some distance north of Mazurah.

The Expenditure was:—

	L.E.
Masonry works and pipes... ..	1,973
Earthwork	2,900
Land, etc.	456
Total... ..	<u>L.E. 5,329</u>

West Hajiz Gammabiyah.—A sum of L.E. 2,226 was paid for land during the year, the project was completed in 1902.

Deirut Escape repairs and remodelling.—At the end of 1903 it was found that a large portion of the extension of the downstream floor of the Deirut Escape had been broken up owing to the heavy discharge from the lock meeting that from the five sluice vents, and causing troubled water on the floor, the river levels at the time being low. As the lock is never used for navigation it was decided to alter it to two extra sluice vents, and for this purpose a centre pier and two stone sills were constructed at a cost of L.E. 1,068, double cast-iron grooves were also fitted for working iron sluice gates in. The large hole in the floor was cleaned out and filled with rubble stone and grouted with cement, under water, to within 0.75 centimetres of the level of the top of the floor, the remainder was filled with rubble masonry laid in cement mortar. Bore-holes were made over the rest of the floor which had not been blown up and the whole thoroughly grouted up with cement. Some 200 blocks of concrete were also made for the protection of the downstream edge of the talus. The total cost was L.E. 2,787.

Improvements at head of Ibrahimiyah Canal.—The low portion of land on the south bank of the canal near the head sluice was filled up with silt dredged from the canal, and the flood bank was widened and strengthened, and revetted with stone at a cost of L.E. 823.

Walidiyah syphon.—As described in last year's report, the end pipes could not be attached. It was therefore decided to raise the pipes again and attach the ends before sinking. This was done and the pipes successfully re-sunk and the whole work completed at a cost of L.E. 1,746.

The syphon was successfully worked during the flood of 1904 and saved an area of 4,000 feddans from being "sharaki."

Petty projects.—Land charges for extension of branch canals in the Asyut converted basins amounted to L.E. 614.

Demarcation of lands. Minia and Asyut.—A sum of L.E. 1,807 was spent on the demarcation of lands occupied by canals and drains in the Daira Samieh estates, a little still remains to be done in 1905.

PROJECTS CIRCLE.—CONVERSION WORKS.

Conversion of the Minia Basins.—This system, comprising Hods Tanashawi, Quran, Tahawi, Deri, Manqatin, Membal, Bardamhi, Garnusi and Salaqusi, has a total area of 107,330 feddans and was converted into perennial irrigation in 1902 and 1903. In 1904 supplementary works found necessary to complete the system, were executed, and on 1st December the whole was handed over by the Projects Circle to the 4th Circle.

The works done in 1904 consisted of strengthening canal banks, excavation of a number of new branch canals and drains, and the construction of several minor masonry works. Payments for land expropriations were also made.

The works executed and the expenditure incurred are as follows:—

				Costing
				L.E.
Clearance of canals and drains	... ..	624,000	c.m.	7,990
Revetment of Sabakhah canal	... ..	746	"	259
Strengthening banks	... ..	934,072	"	11,337
New canals and drains	... ..	428,279	"	6,654
Masonry works	... ..	80	No.	13,053
Drainage pipes	... ..	12	"	357
Ghaffirs huts	... ..	—	"	433

The length of new irrigation channels was 46.6 kilometres and of drainage channels 24.7 kilometre.

Including cost of establishment for working the irrigation, price of land, works, etc., the total expenditure in 1904 becomes L.E. 126,170. Vide Appendix F.

The total expenditure to date is as follows:—

		L.E.	
Southern Minia basins to end of 1903	215,543		
Northern " " " " " "	154,979		
			L.E.
To complete above in 1904		369,622	
		126,170	
Total...		L.E. 495,792	

or cost of conversion of 107,330 feddans is L.E. 4.62 per feddan.

As certain payments for land (L.E. 28,250) have still to be made the total cost of conversion will probably be L.E. 4.88 per feddan executed, which is rather less than the average cost given in last year's report.

The "Sefi" irrigation was most successfully carried out by Ismail Pasha Sirri's staff.

In the Southern Minia system, comprising an area of 51,897 feddans, which received summer water for the second year, an area of 34,157 feddans or 55% of the total area was put under summer crops, chiefly cotton.

In the Northern Minia system, comprising an area of 55,433 feddans, which received summer water for the first year, 15,345 feddans or 27.4% of the total area was put under summer crops, chiefly cotton.

Conversion of Hods Kom El-Sayadah and Sultani.—The conversion of Kom El-Sayadah, 7,000 feddans, and Hod Sultani, 31,000 feddans, was carried out in 1904. The work was started early in February and water was admitted to the Abu Shushah and Sultani canals, the main feeders of the system, by 1st August.

The total length of irrigation channels was...	...	163 kilometres
" " " " drainage " " "	" " "	95 "
" " number of masonry works " " "	" " "	174 No.
" " cube of earthwork " " "	" " "	3,047,375 cubic metres
" " cost of Do. " " "	" " "	47,452 L.E.
" " " " masonry works " " "	" " "	48,067 "

The total expenditure amounted to L.E. 100,182.

Several supplementary channels and masonry works are required to complete the project: these will be executed in 1905.

Conversion of Hods Nina and Nuerah.—The details of this project, comprising an area of 45,648 feddans, have been sanctioned, and work will be executed in 1905.

Conversion of Hods Qusheshah and Riqqah and West Giza.—The general project for the conversion of these basins, comprising an area of 200,000 feddans has, after some very important modifications, been approved. The detailed project is in hand and will be ready during 1905.

The first reach of the Gizah Canal from Lahm to Salibah Qusheshah will be executed in 1905.

Improvement of irrigation in Hoshahs Absug, Marco and Talt.—These hoshahs form part of the old perennial area, but really only a

small portion received "Sefi" water. Owing to the change of system of the canals, due to conversion works, it is necessary to take them in hand. The area is 6,500 feddans, and the project for their improvement has been sanctioned for execution in 1905.

REMODELLING IBRAHIMIYAH CANAL.

In order to supply the converted basins of Minia, Beni Snef and Gizeh Provinces with perennial irrigation, it is necessary to remodel the Ibrahimiyah Canal from Deirut to Ashmant, a length of 207 kilometres.

The following lengths have been taken in hand :—

(a) *Deirut to Minia*.—Dredging was continued between Deirut and Etlidem by the Behera Co. who, in addition to their own plant, borrowed two large bucket dredgers from Messrs. Duport and Jones.

It was seen, however, that the progress was not sufficiently rapid to keep up with the programme for the conversion of the basins, and consequently it was decided to close the canal at the Hafiz regulator at the end of December, and to complete the work by hand labour between Etlidem and Minia; this was very successfully done during a closure of 40 days; the expenditure will be shown in 1905.

The progress to date is as follows :—

Period.	EARTHWORK		Total Expenditure.
	By Hand.	By dredging.	
	C. M.	C. M.	L. E.
Up to end of 1903... ..	839,295	231,400	33,999
During 1904	12,600	954,705	62,253
To end of 1904	851,895	1,186,105	96,252

(b) *Minia to Mutai*.—The remodelling of this reach was completed in 1903. In 1904, stone reverment between Minia and Elsi was completed, the Abn Baqurah syphon built, and the canal straightened at that point: some land was also paid for.

The expenditure during the year was L.E. 17,124.

(c) *Mutai to Mayana*.—The dry work in this reach was done in 1903, and the canal was completed to theoretical section in a 30 days,

closure at Matai from 25th December, 1903 to 25th January, 1904. During the same closure the Matai and Magaga regulators were remodelled, stone revetment executed between Matai and Magaga, and small irrigation outlets built: three road girder-bridges with masonry piers and abutments were also built at Beni Mazar, Aba, and Sheikh Ziad.

Altogether 944,353 cubic metres of earthwork were executed during this closure.

The expenditure during the year was L.E. 35,099

(d) *Mayana to Sharahna*.—In 1904 the dry work only was executed. Altogether 808,581 cubic metres of earthwork were executed and the total expenditure was L.E. 11,254.

SUMMARY.

The above programme of work was extremely heavy, and during the closure of the canal, from 10,000 to 12,000 men were employed. The work was excellently done, and is very creditable to those concerned.

The total expenditure to date on the remodelling of the Ibrahimiyah Canal is L.E. 290,766.

REMODELLING MUHIT DRAIN.

The Western Muhit Drain is the main drain for the converted basins as well as for the old perennial area. It discharges into the Nile at Etsa, Sharahna and Beni Suef, and also into the Yusufi at Abu Rahib, and Mazurah.

During 1904 the following portions were remodelled to meet the requirements of the drainage of the newly converted basins, viz:—

(a) *From Abu Rahib Escape to Salibah Kom Saaydah*.—Work left over from the previous year was completed and payments of land made.

The total expenditure was L.E. 26,690.

(b) *From Salibah Kom Saaydah to Beni Suef Escape*.—The whole drain along Muhits Sultani, Nina and Nuerah, and through the Beni Suef cross drain was remodelled.

Altogether 925,830 cubic metres of earthwork and 13 masonry works were executed.

The total expenditure was L.E. 26,729.

SUMMARY.

The main drain serving the Asyut, Minia and Beni Suef Provinces is now practically completed. A few subsidiary works and payments for land still remain. The drain is a magnificent one, and is very efficient. Considering the nature of the work, mostly in water, the result is very creditable.

The total expenditure to end of 1904 is L.E. 132,850.

ETSA PUMPING STATION.

This station was completed last year. It consists of four Vertical direct-acting engines of 165 h.p. each, four centrifugal pumps of 40 inches diameter each, six boilers with a working pressure of 125 lbs. per sq. inch, and all accessories.

During the official trials, certain defects were discovered which have since been put right, and some auxiliary works were executed in 1904 to complete the whole installation.

The pumps were worked from 16th August till 2nd September and again from 9th October to 21st October.

The whole installation is now in good working order, and has been given over to the 4th Circle, by whom it will be worked in future.

The expenditure in 1904 for machinery and auxiliary works was L.E. 5,807.

The total expenditure on this installation to the end of 1904 is L.E. 48,744.

SUMMARY OF WORKS EXECUTED IN 1904 IN CONNECTION WITH THE CONVERSION OF THE MIDDLE EGYPT BASINS.

			Costing L.E.
Earthwork	8,807,993 cubic metres	...	178,994
Masonry works	285 No. ... ..	...	81,216
Stone revetment	40,626 cubic metres	...	12,537
Land expropriated	2,132 Fesdans	...	80,285
Length of new canals... ..	209 kilometres		—
" " " drains... ..	120 "		—
Length of remodelled canal	32 "		—
" " " drain...	39 "		—

That such a heavy programme of work should have been carried out successfully in one season is most creditable to Ismail Pasha Sirri, Inspector Projects Circle, and his staff. Only those acquainted with the work can realise the enormous amount of surveying, levelling,

designing, and construction details involved in converting such large basins as Tanashawi (36,000 feddans) and Sultani (31,000 feddans) from a system which has existed for centuries to an entirely new system of irrigation, in one season, without any loss either to Government or the landowners.

To those personally who laid down the general lines on which Ismail Pasha Sirri has worked out his detailed projects, it is very satisfactory to know that over 205,000 feddans have been converted from basin to perennial irrigation, at a cost of L.E. 1,293,000, without leaving one single feddan unirrigated.

COST OF CONVERSION WORKS.

There is no reason to anticipate that the cost of the actual conversion works in the basins themselves, exclusive of the cost of the remodelling of the Ibrahimiyah Canal, main Muhiit drain, and pumping stations, will exceed the figure of L.E. 4.5 given in last year's report.

TOTAL COST OF CONVERSION WORKS.

As shown in last year's report the total cost of the conversion works in the Asyut, Minia, Beni Suef and Gizah basins, comprising an area of 451,000 feddans, inclusive of all subsidiary works, is estimated at L.E. 3,200,000 or L.E. 7 per feddan converted.

Up to date 205,522 feddans have been converted at a cost of L.E. 1,292,770. To complete the works the following is therefore required :—

	L.E.	
Expenditure to end of 1901	1,292,770	
Grant for 1905	483,000	
	<hr/>	
Total cost as above		L.E. 1,775,770 <hr/> 3,200,000
		<hr/>
Balance required after 1905		L.E. 1,424,230
		<hr/>

or say L.E. 1,500,000 spread over 3 years.

RESULT OF THE CONVERSION WORKS.

Up to date 205,000 feddans have been converted at a cost of L.E. 1,292,770, or adding for land not paid for and other contingencies, L.E. 1,400,000.

For this expenditure of L.E. 1,400,000 the annual rental value has increased L.E. 4 per feddan or L.E. 820,000 and the actual sale value L.E. 40 per feddan or L.E. 8,200,000.

As an example of the enormous benefits derived from the Conversion Works, the cotton crop alone of the Minia basins may be taken. Out of a total converted area of 109,000 feddans, an area of 49,700 feddans was planted with cotton; this must have been worth from L.E. 600,000 to L.E. 700,000 or practically the total cost of the works at L.E. 7 per feddan converted.

RENTAL VALUES IN MIDDLE EGYPT.

The increased rental values in the converted basin area has been shown above. It may be as well to show what has been the increased rental values in the old perennial area since the construction of the Reservoir works.

The following figures have been kindly furnished by Birch Pasha, Inspector General of the Daira Sanieh Administration, showing the rental values in the Teftiches dependent on the Ibrahimiyah Canal:—

YEAR.	Area in Feddans.	Rents.	Mean rent per feddan.	
		L. E.	L. R.	
1901... ..	132,858	489,645	3	68
1902... ..	135,117	535,013	3	95
1903... ..	133,888	612,131	4	57
1904... ..	132,389	737,974	5	57
1905... ..	131,457	956,458	7	27

In 1901 Birch Pasha commenced his energetic measures for the improvement of the estates, and continued them in 1902 and 1903, spending altogether a sum of L.E. 52,829.

In 1902 the Asynt Barrage was completed and used for the first time during the flood of that year.

The result has been an increase of 95 % in the annual rental, and a profit of L.E. 882,996 in the past 4 years in comparison with the year 1901.

It is interesting to note that, notwithstanding this very high increase in rents, the arrears due from the tenants have decreased from L.E. 13,216 in 1899 to L.E. 818 in 1903, showing that the tenants can well afford to pay the enhanced rents.

Part. III. — RESERVOIR WORKS

ASWAN RESERVOIR.—FILLING AND DISCHARGING

The filling of the Reservoir commenced on the 1st December and the full level of R.L. 106.00 was reached on the 10th March. During December and the greater part of January from 10 to 12 million cubic metres of water were extracted from the river : during February from 9 to 10 millions and in March from 6 to 7 millions.

From 10th March to 10th May the Reservoir was kept at its full level, as the supply in the river was sufficient for all irrigation purposes.

On the 10th May the discharge commenced and the following quantities were added to the river :—

10th May to 20th May	4 millions cubic metres per day
21st May to 3th June	10 " " " " "
6th June to 10th June	30 " " " " "
11th June to end June	35 " " " " "

The Reservoir was empty towards the end of June.

The large discharge from the 6th June was made on account of the good rise on the Khartoum gauge: there was afterwards a slight fall at Khartoum and, in fact, no rise for some days, so that it would have been better to have discharged the Reservoir more gradually : this, however, could not have been foreseen.

The result of the discharge of the Reservoir, added to the good supply in the river, was to give an abundant supply in all the summer canals, and, except for a few days in July, absolutely no difficulty occurred in irrigating the summer crops.

The whole of the regulation was, as usual, very carefully carried out by Mr. MacDonald and his staff.

Protective works below sluices of dam. — In the construction of a talus below the upper sluices at the eastern and western extremities of the dam, a sum of L.E. 5,000 was spent.

An advance of L.E. 20,000 was also made by the Finance Department for the continuance of the work and the collection of materials for the coming year : of this sum, L.E. 12,828 was spent, principally in the purchase of cement and the collection of rubble for the masonry. The masonry put in has stood the action of the water very satisfactorily.

The protective works will be carried out on an extensive scale in 1905.

Navigation works.— In improving the approaches and building a spill weir on the western side of the new sahel lock between the dam and Aswan, a sum of L.E. 3,000 was spent.

In the improvement of the southern end of the navigation channel a further sum of L.E. 1,000 was spent near the head of the main western channel.

ASYUT BARRAGE.

Regulation was commenced on the Asyut Barrage on the 30th March. The maximum head was 1.19 metres on the 21st April.

Throughout the flood the lower gates were kept down, giving a head of 0.28 metres only. It is now decided to make the lower length of grooves double, so that both gates can be dropped on to the floor and regulation greatly facilitated during flood. In repairing the downstream talus 10,113 cubic metres of stone were used: it is now in excellent condition. During 1905 the talus will be lengthened another 30 metres.

This barrage has been of immense value to Middle Egypt.

RESULTS OF THE RESERVOIR WORKS IN MIDDLE EGYPT.

The Aswan Reservoir was completed and brought into use during the winter of 1902; the Asyut Barrage was completed early in 1902 and used during the flood of that year. In Middle Egypt alone, the following results have been obtained from works constructed in connection with the Reservoir works.

WORKS.	Area affected in feddans.	Actual expenditure.	Increased annual rental value.	Increased sale value.
		L.E.	L.E.	L.E.
West of Yusufi-Minia, construction of Basins	90,000	211,000	180,000	1,800,000
Conversion works ...	205,000	1,293,000	820,000	8,200,000
Daira Sanieh Estates, paid by D. S. Admini- stration	131,000	52,800	473,000	4,730,000
Fayum Province lands Kharez-Zimam... ..	40,000	200,000	80,000	1,000,000
Total... ..	466,000	1,756,800	1,553,000	15,730,000

The total cost of Reservoir works was L.E. 3,237,263
Add expenditure as above... „ 1,756,800

Total... L.E. 4,994,065

Thus by a total Government expenditure of L.E. 5,000,000 the increased annual rental of land in Middle Egypt alone to date has been L.E. 1,500,000 and the increased value of land L.E. 15,700,000.

In addition to the above the closure of the Asyut Barrage in the flood of 1902 is estimated to have given a benefit of L.E. 600,000 in Middle Egypt. The above only represents the results to date; the figures will be much increased annually as the conversion works and the remodelling works in the Fayoum progress.

In Lower Egypt great benefits have resulted in addition to the above but it is very difficult to give even an approximate figure.

Part. IV.—WORKS AND ESTABLISHMENT.

SECTION I.—MAINTENANCE AND REPAIRS.

Details of the quantities of earthwork executed during the year and its cost are given in Appendix D. The total quantities are as follows:—

CIRCLE.	BY HAND		BY DREDGING.	
	Quantity.	Cost.	Quantity.	Cost.
	C.M.	L.E.	C.M.	L.E.
4th Circle... ..	3,943,965	53,411	—	—
5th Circle... ..	2,849,994	33,125	—	—
Girga Directorate	2,262,327	23,764	—	—
Asyut Barrage Directorate	537,310	5,919	100,000	7,109
Grand Total... ..	9,593,596	115,219	100,000	7,109

The average rate for hand work is 1.21 P.T. per cubic metre, which is quite normal.

Spurs in the Ibrahimiyah Canal.—There was no expenditure during the year.

River protective works.—The following statement shows the cubes of stone purchased, and built into river spurs and revetment during the year, and the expenditure incurred on transporting and building Government stone into the same.

CIRCLE.	NEW STONE.		Transport and repacking old stone.	Total cost.
	Quantity.	Cost.		
	C.M.	L.E.	L.E.	L.E.
4th Circle	9,519	1,844	388	2,232
5th Circle	2,613	513	83	596
Girga Directorate	7,717	1,335	458	1,793
Asyut Barrage Direct.	8,286	1,570	—	1,570
Total... ..	28,135	5,262	929	6,191

No new sites were taken in hand.

The following expenditure was incurred in revetting canal banks below regulators and other important points:—

CIRCLE.	NEW STONE		Transport and building Govt. stone.	Total cost.
	Cube.	Cost.		
	C.M.	L.R.	L.R.	L.R.
4th Circle	9,787	2,654	226	2,880
5th Circle	—	—	—	—
Girga Directorate ...	882	219	101	320
Asyut Barr. Directorate	14,090	2,733	162	2,895
Totals... ..	24,759	5,606	489	6,095

Both in the 4th Circle and the Asyut Barrage Directorate a considerable amount of revetment is being done on the canal banks below regulators to great advantage. This will be continued so as to save maintenance in earthwork.

SECTION II.—NEW WORKS AND IMPROVEMENTS.

(*Exclusive of Special works*).

Earthwork.—The quantity and cost of earthwork executed in new channels and banks was as follows :

CIRCLE.	Cube.	Cost.
		L. E.
4th Circle	106,206	1,403
5th Circle	355,552	4,050
Girga Directorate... ..	57,351	606
Asyut Barrage Directorate	1,233	25
Total... ..	520,342	6,084

The length of new channels and banks are given in the following statement :—

CIRCLE.	LENGTH IN KILOMETRES.	
	New channels.	New banks.
4th Circle	10,296	4,336
5th Circle	14,801	5,583
Girga Directorate	3,847	1,672
Asyut Barrage Directorate	—	90
Total... ..	28,944	11,681

The details are given in Appendix E.

Basin banks protection.—Appendix K shows the progress made with, and expenditure incurred on, revetting basin banks.

The total expenditure under this head was L.E. 9,123.

New masonry works for irrigation.—A list of new masonry works and building charged to Ordinary Budget is given in Appendix B.

The total expenditure under this head was L.E. 7,122.

Masonry works remodelled and repaired.—A list of masonry works remodelled and repaired is given in Appendix C.

The total expenditure under this head was L.E. 7,002.

SECTION III.—AGRICULTURAL ROADS.

4th Circle.

In the Asyut Province a programme and estimate for the construction of eight roads in the Mellawi Mirkaz were sanctioned, and work is now proceeding.

The only expenditure in 1904 was L.E. 45.

In the Minia Province a programme for new roads has been drawn up and agreed to by the Provincial Council: the matter, however, must be again brought before the Council regarding the Daira Sanieh Administration's contribution. In the Fayum Province only one new road

was made, called the Abgig road, length 3,557 metres and cost L.E. 600. In addition a sum of L.E. 481 was spent on land charges and labour.

In repairs to roads a sum of L.E. 1,050 was spent.

Girga Directorate.

In December, 1903 the Provincial Council of the Girga Mudiriyah passed a project for the construction of 4 agricultural roads at a cost of L.E. 18,041. Work was commenced in 1904.

SECTION IV.—BRIDGES TO REPLACE FERRIES.

In the Fayum Province L.E. 1,524 was paid for a new iron bridge across the Yusufi in the Fayum town to replace the old rotten wooden bridge.

In the Minia Province L.E. 3,432 was spent on new iron bridges at Beni Mazar, Abu, and Cheikh Ziad.

In the Girga Province nine new bridges, with masonry piers and abutments and iron girders, were built at a cost of L.E. 3,826: these are paid for by a special cess on the cultivated area of the province.

In the Kenh Province twelve bridges were built at a cost of L.E. 11,274 and in the Aswan Province four were built at a cost of L.E. 1,892. These were all paid for by a special cess on the cultivated area of the province.

Altogether 29 bridges were built at a cost of L.E. 21,948 of which L.E. 4,956 was provided from Ferry Funds, and L.E. 16,992 collected as a special cess on the lands benefitted.

SECTION V.—WORKS OF PRIVATE ENTERPRISE.

Agricultural railways in Fayum Province.—During 1904 no new lines were made.

Use of water power in the Fayum.—In last year's report, page 78, it was stated that the lake at Tamiyah had been run off by inserting two wrought-iron pipes, each 1.50 metres diameter, through the old retaining wall: this was done to improve the drainage of the Rodah and the Rubiyat lands. There is a considerable fall in the discharge from these pipes, which has been utilized by Boghos Pasha Nubar to drive

a turbine for the development of electrical power to work a ginning factory. All these works were constructed during the year, and the cotton ginning factory has been in use during the season 1904-1905.

Nile land reclamation works.—Mr. Dempster, Chief Engineer of the Nile Land Reclamation Works Co., writes as follows on the works undertaken in 1904:—

"Reclamation works were undertaken during 1904 at two new sites, namely, in the eastern khor opposite Feshn, and in the western khor near the Hamlet of Hataba, a few kilometres below Biba. The fall of the river at Feshn, as early as the latter part of February, 1904, rendered navigation extremely difficult from the south end of the Island of Hebek to two kilometres below the town of Feshn. Opposite the latter town the river spread itself, during the succeeding months of March to July, into a shallow, sprawling, difficult stream, only a small backwater being available for small country boats next to the Feshn shore.

A long timber regulator was constructed at the tail of the Hebek or eastern khor, the effects of which were at once apparent as soon as the river began to rise in July.

Though very large discharges were passed through the regulator, the main stream was forced into the western channel. A fair amount of land has been deposited, and is under cultivation within the khor, with sand and mud on the foreshore outside the khor. The cold weather stream of 1904-1905 was found next to the Feshn shore, making navigation much easier in this difficult reach.

At Hataba, below Biba, a long regulator of timber trestles, with masonry abutments, was constructed. Land in considerable quantity has been thrown up from the hamlet of Hataba almost up to the town of Biba.

The river has been forced into very good train from Biba downwards: it now clings to the eastern rocky shore, and is gradually washing away a heavy sand shoal opposite the east of Hataba, which shoal turned the river during the low summer supplies of March to June, 1904 against the cultivation on the west bank. It is hoped that the whole of this dangerous shoal will disappear during the flood of 1905."

Notwithstanding many difficulties which have arisen regarding the ownership of the land reclaimed, this Company has constructed, at considerable cost, permanent training works, which have been successful in improving the navigable channel of the river, and in reclaiming a considerable area of land, often found to be the property of others according to existing regulations.

SECTION VI.—EXPENDITURE.

An abstract of the expenditure is given in Appendix A and is as follows:—

	L.E.
Establishment and contingent charges..	... .. 43,082
Works	764,644
Total	<u>L.E.807,676</u>

SECTION VII.—ESTABLISHMENT.

During my absence of leave Mr. Clowes, J.L., 4th Circle, held charge of the post of Inspector General.

During Mr. Clowes' absence on leave, Mr. Tottenham held charge of the 4th Circle.

During Ismail Pasha Sirri's absence on leave Abdalla Bey Wahbi took charge of the Projects Circle.

During Mahmoud Bey Sidky's absence on leave Mr. Waghorn took charge of the 5th Circle.

At the end of the year many administrative changes commenced, which will be described in next year's report, as they only really came into effect from 1st January, 1905.

A. L. WEBB.

APPENDICES

APPENDIX A.

ABSTRACT OF EXPENDITURE IN 1904 UNDER THE DIFFERENT SUB-HEADS OF THE BUDGET.

SUB-HEADS OF BUDGET.	EXPENDITURE						
	4th Circle.	Projects.	5th Circle.	Girga.	Asyut Barrage Directorate.	Aswan Reservoir.	Total.
	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.
SUB-CHAP. I.—Establishment.							
Classified	8,837	1,927	4,064	3,536	1,518	1,573	21,455
Hors Cadre	5,218	—	1,340	1,163	1,809	2,964	12,494
Total, Sub-Chap. I ...	14,055	1,927	5,404	4,699	3,327	4,537	33,949
SUB-CHAP. II.							
Travelling Allowances	3,818	—	1,220	1,299	474	160	6,971
Telegrams	256	—	181	154	—	—	591
Dahabiyahs	114	—	419	151	—	—	684
Office rent and water	235	—	61	468	—	—	764
Sundries	15	—	41	17	—	—	73
Total, Sub-Chap. II ...	4,438	—	1,922	2,089	474	160	9,083
SUB-CHAP. III.							
Furniture and instruments ...	47	—	47	32	20	20	166
SUB-CHAP. IV.							
New works	500	—	1,571	1,490	—	—	3,561
SUB-CHAP. V.							
Repairs and Maintenance	7,549	—	2,847	4,044	8,960	15,600	32,000
SUB-CHAP. VI AND CORVÉE ABOLITION							
Earthworks and works for decreasing the cost of maintenance of banks and channels	62,601	—	36,500	28,550	16,077	—	143,728
Special new works	16,553	15,817	—	—	—	9,000	41,370
SPECIAL "CAISSE CREDIT."	63,500	419,490	2,046	2,476	—	12,828	500,340
NEW AGRICULTURE, ROADS & BRIDGES	1,126	—	11,170	5,298	—	—	17,594
SPECIAL LOW FLOOD CREDIT	1,986	—	5,000	3,400	1,817	—	12,203
FERRY FUNDS	1,524	3,432	—	—	—	—	4,956
SUMS COLLECTED UNDER CANALS ACT, &c.	731	—	46	438	511	—	1,726
Total of Works ...	156,117	438,739	59,227	45,728	27,385	37,448	764,644
Grand Totals ...	174,610	440,666	66,553	52,516	31,186	42,145	807,676

APPENDIX B.

LIST OF NEW MASONRY WORKS EXECUTED IN 1904 AND THEIR COST,
EXCLUSIVE OF SPECIAL WORKS.

NAME OF WORK.	COST.	Total per Province.	Total per Circle.
	L.E.	L.E.	L.E.
4TH CIRCLE.			
FAYUM PROVINCE.			
Construction of Nasbah El Maslut	118		
" " 2 small aqueducts Bahr Talat	129		
" " Bahr Zawia regulator	150		
" " Marble gauge in Lake Qaoun	246		
		643	
BENI SUFF PROVINCE.			
Road bridge over Syada canal	243		
		243	
MINIA PROVINCE.			
Inspection house and stables at Matai	500		
Conversion of Abu Rahib bridge into regulator	552		
		1,052	
ASYUT BARRAGE DIRECTORATE.			
ASYUT PROVINCE.			
Road bridge at Beni Hussein	280		
Escape for Hosha Muabda	449		
Escape for Hod el Mandara	1,104		
Reservoirs in Barrage grounds	195		
		2,038	
GIRGA DIRECTORATE.			
ASYUT PROVINCE.			
Feeder culvert for Sahil Malmar	211		
		211	
GIRGA PROVINCE.			
Rest house and stables at Tahta	423		
Upper floor Girga Directorate office	560		
" " Taliat store	296		
		1,279	
5TH CIRCLE.			
KENA PROVINCE.			
Hosha Nagada feeder culvert	243		
Escape El Salamiyuh west	277		
Sayula El Gebelen Head	485		
Escape Hod El Ashi west	566		
Completion of new store at Hamad Escape	85		
		1,656	
Grand Total... ..			7,122

APPENDIX C.

LIST OF MASONRY WORKS REPAIRED AND REMODELLED IN 1904 AND THEIR COST.

NAME OF WORK.	Cost.	Total per Province.	Total per Circle.	Grand Total.
	L.E.	L.E.	L.E.	L.E.
4TH CIRCLE.				
ASYUT PROVINCE	200			
Repairs to Inspection houses	511			
" " Karamum Escape	229			
" " Hasibah Regulator... ..	137			
Alteration to Dessa Canal head	629			
" " Saheliyah Canal head	125			
Painting iron gates at Deirut... ..	143			
Petty repairs to works	105			
Remodelling Ashimmin head sluice	136			
Alterations to Dermowas bridge	94			
		2,209		
MINIA PROVINCE.				
Painting iron gates—Nazlet El Abib	97			
Alterations to Magaga Inspection house	113			
Repairs to Inspection House on Yusufi... ..	200			
" " Nazlet El Abid culvert... ..	49			
Fixing iron pipes in Muhit drain at Itga	106			
Petty repairs to works	337			
		902		
BENI SUFF PROVINCE.				
Replacing wooden shoots by iron pipes	221			
Petty repairs to works	279			
Painting iron gates at Mazurah & Khoshelah	153			
		653		
FAYUM PROVINCE.				
Repairs to bridge on Bahr Agamin	75			
" " Falls-Chalan drain	158			
Petty repairs to works	114			
Repairs to Inspections houses	195			
Painting gates—Hassan Wasif head	70			
Pipes under road of Bahr Zunkat	272			
		844	4,708	
<i>Carried forward...</i>				4,708

LIST OF MASONRY WORKS REPAIRED AND REMODELLED IN 1904 AND THEIR COST (*continued*).

NAME OF WORK	Cost.	Total per Province.	Total per Circle.	Grand Total.
	L.E.	L.E.	L.E.	L.E.
<i>Brought forward...</i>				4,708
5TH CIRCLE.				
KENA PROVINCE.				
Repairs to Gebelawi Escape	228			
Klirba west Escape... ..	46			
El Emaya west Escape	38			
Miscellaneous petty repairs	160			
Arrears	166			
		638		
ASWAN PROVINCE.				
Miscellaneous petty repairs	61			
		61		
			699	
GIRGA DIRECTORATE.				
GIRGA PROVINCE.				
Talihat Regulator—Arrears	520			
Mugubra Regulator	290			
Storerooms at Birba and Nag Tammam ...	83			
Miscellaneous petty repairs	186			
		1,079		
ASYUT 2ND SECTION.				
Arrears of 1903... ..	97			
Duwer Regulator	77			
Miscellaneous Petty repairs	111			
		285		
			1,364	
ASYUT BARRAGE DIRECTORATE.				
Repairs to Staff Quarters	40			
Miscellaneous Repairs	191			
		231		
			231	
				2,294
Grand Total				7,002

APPENDIX D.

EARTHWORK IS MAINTENANCE CHARGED TO REGULAR AND CORVÉE PROJECTS, UPPER EGYPT, 1904.

PROVINCE.	Repairs to banks.	Clearance of Nile canals and drains.	Clearance of Said canals.	Clearance of Said drains and new drains.	Closing of cuts.	Sudds in canals.	New ramels and banks.	Repairs to agricultural roads.	Total.	Cost.
	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	L.R.
4TH CIRCLE.										
Fayum	7,661	—	438,443	350,812	5,700	861	13,030	11,139	817,616	12,882
Beni Suef	491,335	229,469	431,979	25,557	4,946	8,207	12,721	7,525	1,221,803	13,785
Minia	519,018	114,363	529,473	—	36,688	3,293	56,280	32,961	1,292,076	16,766
Assut	290,327	23,632	242,411	—	2,297	—	23,171	—	582,440	9,978
Total, 4th Circle	1,308,603	376,864	1,662,396	376,369	19,631	12,361	106,296	51,625	3,943,965	53,411
5TH CIRCLE.										
Kena	568,615	1,130,385	111,217	—	12,655	26,640	314,981	—	2,163,893	24,549
Aswan	180,160	460,506	—	—	3,745	1,119	40,571	—	686,101	8,577
Total, 5th Circle	748,775	1,590,891	111,217	—	15,800	27,759	355,552	—	2,849,994	33,126
GIRGA DIRECTORATE.										
Girga	661,569	1,431,600	—	—	11,152	9,422	—	—	1,816,743	18,821
Assut 2nd Section	214,922	225,429	—	—	2,371	3,362	—	—	445,584	4,943
Total, Girga Directorate...	878,991	1,657,029	—	—	13,523	12,784	—	—	2,262,327	23,761
ASSUT BARRAGE DIRECT.										
Assut	263,436	266,420	—	—	3,243	4,211	—	—	537,310	5,919
Dredging Ibrahimiyah Canal	—	—	100,000	—	—	—	—	—	100,000	7,110
Total Assut Barrage Direct.	263,436	266,420	100,000	—	3,243	4,211	—	—	637,310	13,029
Grand Total	3,499,865	3,591,204	1,873,523	376,369	82,197	57,415	461,758	51,625	9,693,596	121,330

APPENDIX E.

STATEMENT SHOWING THE NEW BANKS AND CHANNELS MADE IN 1904,
EXCLUSIVE OF "SPECIAL WORKS."

NAME OF WORK.	Length in kilometres.	Quantity of earthwork.	Total quantity.
		C.M.	C.M.
4TH CIRCLE.			
ASYUT PROVINCE.			
Extension of Dwira branch	0.695	1,572	
" Abu Anmar branch	0.208	1,233	
New drain E. of Badrman	0.600	1,083	
Bank of Kokab drain... ..	0.600	3,457	
Saulad Canal	0.728	4,563	
Ashmunin branch canal at Itqa	1.154	7,264	
Miscellaneous junctions	0.221	5,001	
			24,173
MINIA PROVINCE.			
Five diversions at East Nile Tarrad	2.156	30,543	
Matahra Nile bank diversions	0.611	7,232	
Sabbah Kamadir diversion	0.180	5,133	
Nile Tarrad diversion at Abu Hasiba	0.110	1,042	
Extension of Putrakhmma Canal	2.655	9,453	
" Damaris "	0.475	2,877	
			56,280
BENI SUFF PROVINCE.			
Diversion of Nile Tarrad at Geziret Mausara	0.679	12,723	
			12,723
FAYUM PROVINCE.			
Bahr Abuna drain	0.560	3,030	
" Rodah "	1.500	5,000	
Forcos branch canal	1.500	5,000	
			13,030
5TH CIRCLE.			
ASWAN PROVINCE.			
Prolongation of Silwa Canal	1.564	29,598	
" Eglit "	1.414	10,973	
			40,571
<i>Carried forward</i> ...	—	—	146,777

STATEMENT SHOWING THE NEW BANKS AND CHANNELS MADE IN 1904,
EXCLUSIVE OF "SPECIAL WORKS"—continued.

NAME OF WORK.	Length in kilometres.	Quantity of earthwork.	Total quantity.
		C.M.	C.M.
<i>Brought forward</i> ...	—	—	146,777
KENA PROVINCE.			
Hod El Ashi Masraf	3·000	15,741	
Diversion of Sayala El Kasr	1·138	32,289	
Prolongation of Ghilasi Canal	7·685	120,109	
Bank on left of Ghilasi Canal	2·135	89,084	
Nile Tarrad Diversions Hod Hen	1·808	39,479	
Salamiya	0·550	5,651	
Hoshah bank El Muhamid	0·770	4,801	
Nile Tarrad Diversion El Dimikral	0·320	7,827	
			314,981
GIRGA DIRECTORATE.			
GIRGA PROVINCE.			
Extension of Sayala El Hakimi	3·196	29,635	
Diversion of Nile Tarrad Hod Beni Hilal	0·518	6,644	
Sayala Hoshah Hamada	0·194	1,538	
Diversion Nile Tarrad Hoshah Sheikh Zen El Din	0·662	8,955	
Diversion Nile Tarrad Hoshah Qaw	0·492	5,548	
Extension of Sayala Gezireh Awlad Salim	0·451	5,031	
			57,351
ASYUT BARRAGE DIRECTORATE			
Diversion of Nile bank at Hosha Maabda	0·090	1,233	
			1,233
Grand Total...	—	—	520,342

ABSTRACT.

CIRCLE	New channels.	New banks.	Expenditure.
	Kilometres.	Kilometres.	L.E.
4th Circle... ..	10·296	4·336	1,403
5th Circle... ..	14·801	5·583	4,051
Girga Directorate	3·847	1·672	606
Asyut Barrage Directorate	—	0·090	25
Total...	38·944	11·681	6,085

APPENDIX F.

GENERAL ABSTRACT OF EXPENDITURE ON "SPECIAL WORKS" CHARGED TO SPECIAL CAISSE CREDIT AND SPECIAL GRANT FROM ORDINARY BUDGET.

NAME OF PROJECT.	NAME OF WORK.	EXPENDITURE.				
		Ordinary Budget.	Caisse Credit.	Total per work.	Total per Project.	Total per Circle.
		L.E.	L.E.	L.E.	L.E.	L.E.
	PROJECTS CIRCLE.					
Minia Basins Conversion.	Earthwork	56	25,935	25,991		
	Masonry works	741	12,510	13,051		
	Land	—	79,350	79,350		
	Working canals	2,160	—	2,160		
	Pipes W.L.	—	1,508	1,508		
	Miscellaneous	433	3,871	4,307		
					126,170	
Hode Kom Sanyda and Sultan Conversion.	Earthwork	115	47,367	47,482		
	Masonry works	3,000	45,067	48,067		
	Pipe outlets	—	1,131	1,131		
	Land	—	2,071	2,071		
	Stone revetment	—	865	865		
	Working canals	566	—	566		
					100,182	
Remodelling Ibrahimiyah Canal.	Earthwork	891	85,686	86,087		
	Masonry works	500	2,000	2,500		
	Stone revetment	613	10,258	10,871		
	Land	—	13,682	13,682		
	Matai and Magaga Regulators remodelled	—	2,991	2,991		
	Abu Bakara syphon	1,000	3,000	4,000		
	Miscellaneous	496	1,573	2,069		
					122,299	
Remodelling Muhl Drain.	Earthwork	524	18,910	19,434		
	Masonry works	455	10,272	10,727		
	Stone revetment	—	542	542		
	Land	—	22,716	22,716		
					53,419	
Etsa Pumping Station.	Plant	—	4,709	4,709		
	Coal store	174	—	174		
	Workmen's quarters	125	—	125		
	Weir in delivery channel	—	500	500		
					5,808	
Hode Nina and Nuera conversion.	Manufacture of bricks and mortar	—	4,859	4,859		
					4,859	
Improvement of Irrig. for Hoshas Abang, Marco and Talt.	Head sluice Along Canal	—	621	621		
					621	
Temporary Establishment and Petty expenses.	Establishment, Protection, Furniture, &c.	665	17,783	18,448		
					18,448	
	Carried forward	—	—	—	—	431,806
						431,806

GENERAL ABSTRACT OF EXPENDITURE ON "SPECIAL WORKS" CHARGED TO SPECIAL CAISSE
CREDIT AND SPECIAL GRANT FROM ORDINARY BUDGET (*continued*).

NAME OF PROJECT.	NAME OF WORK.	EXPENDITURE.				
		Ordinary Budget.	Caisse Credit.	Total per Work.	Total per Project.	Total per Circle.
	<i>Brought forward</i> ...	—	—	—		431,806
	4TH CIRCLE.					
Demarcation of land	Asyut and Minia	—	1,807	1,807	1,807	
Land.	Asyut and Minia	614	—	614	614	
Waldiyah Syphon.	Completion	1,746	—	1,746	1,746	
Hoshinulab Canal.	Filling and alterations at head ...	2,241	—	2,241	2,241	
Delrut Escape.	Repairs	3,855	—	3,855	3,855	
W. Hafiz Gannabiyah.	Land	2,226	—	2,226	2,226	
Hoshnab W. of Yusufl—Minia Province.	Masonry works	897	1,076	1,973		
	Earthwork	960	2,000	2,960		
	Revetment	365	—	365		
	Land	91	—	91	5,329	
Remodelling Fayum canals.	Establishment	—	2,514	2,514		
	Sellah Canal	1,455	39,791	41,256		
	Qubafa Canal	201	1,100	1,301		
	Gharak Canal	863	11,070	11,933		
	Faidulla Canal	1,681	3,924	5,605	62,015	79,836
	5TH CIRCLE.					
Hod Hammad railway diversion.	Earthwork	—	1,856	1,856	1,856	1,856
	GIRGA DIRECTORATE.					
Irrigation improvements.	Nag Tammam Regulator... .. .	—	203	203		
	Hod Moedin Culvert	—	201	201		
	Hod Baga Escape	—	210	210		
	Sahlah Time Culvert	—	234	234		
	Ambariya Regulator	—	291	291		
	Hod Baga Culvert	—	233	233		
	Hod Sahagya Regulator	—	583	583		
	Minia W. Culvert... .. .	—	310	310		
	Hoshnab Razuna Culvert	—	178	178	2,476	2,476
	ASWAN RESERVOIR.					
Protective works.	Masonry... .. .	—	6,500	6,500	6,500	6,500
	Grand Total... .. .	—	—	—	—	522,174

LIST OF MASONRY WORKS EXECUTED UNDER "SPECIAL WORKS" GIVEN IN APPENDIX F.
(continued).

NAME OF PROJECT	NAME OF WORK.	COST.		
		Per Work.	Total per Project.	Total per Circle.
		L.E.	L.E.	E.L.
	<i>Brought forward.</i>	—	—	32,552
	PROJECTS CIRCLE			
Conversion of Minia Basins.	90 masonry works	13,053		
	Gaffers' huts	133	13,486	
Conversion of Hods Kotu Saaydah and Sultani.	28 works in Kom Saaydah	11,882		
	146 works in Sultani	28,096	39,978	
Improvement of Irrigation in Hoshaba Abang, Marco and Talt.	Along Canal head	621	621	
Remodelling Ibrahimiyah Canal.	Lengthening Mellawi bridge	347		
	Sheikh Nema tomb	127		
	Road bridges between Hufix and Minia	1,299		
	Abu Baqarah cyphon	5,014		
	8 small works	2,599		
	Remodelling Matai Regulators	1,555		
	Remodelling Magaga Regulator	1,436		
	3 road bridges	2,140	14,810	
Remodelling Muhit Drain.	13 masonry works	10,726	10,726	
Elsa Pumping Station.	Workmen's quarters	125		
	Coal stores, &c.	474		
	Weir in delivery channel	500	1,099	80,750
	QIRGA DIRECTORATE			
Irrigation Improvement works.	3 regulators	1,976		
	5 culverts	1,190		
	1 escape	210	2,476	2,476
	Grand Total	—	—	115,978

APPENDIX H.

LIST OF NEW AND REMODELLED BASKS AND CHANSELS EXECUTED UNDER
"SPECIAL WORKS" GIVEN IN APPENDIX F.

NAME OF PROJECT.	NAME OF WORK.	Length in kilometres	Quantity of earthwork	Cost.	
				Per work.	Total per Project.
			C.M.	L.E.	L.E.
	4TH CIRCLE.				
Hoshahs of W. Yusufi Minia.	Hoshah banks	42,500	220,568	2,900	2,900
	4th Reach A. Wahbi ...	14,000	710,000	12,868	
	3rd Reach Completion ...	17,500	602,233	3,162	16,030
Fayoum remodel- ling Projects.	Bahr Qohafa	12,500	70,800	900	900
	Bahr Gharak	42,135	40,000	9,000	9,000
	Bahr Tanhalla	12,131	170,000	2,380	2,380
	Total 4th Circle...	—	—	—	31,210
	PROJECTS CIRCLE.				
Conversion Minia Basins.	Irrigation Channels... ..	46,600	428,279	6,664	6,664
	Drainage Channels... ..	24,700			
Conversion Hods Kom Saaydah and Sultani.	Irrigation Channels... ..	162,600	3,047,375	47,452	47,452
	Drainage Channels... ..	95,200			
Remodelling Ibra- himiyah Canal.	Excavation	32,000	2,720,239	86,087	86,087
Remodelling Muhit Drain.	Excavation	39,000	1,052,161	19,434	19,434
	Total Projects Circle ...	—	—	—	159,637
	Grand Total...	—	—	—	190,847

APPENDIX K.

REVTMENT OF BASIN BANKS WITH STONE.

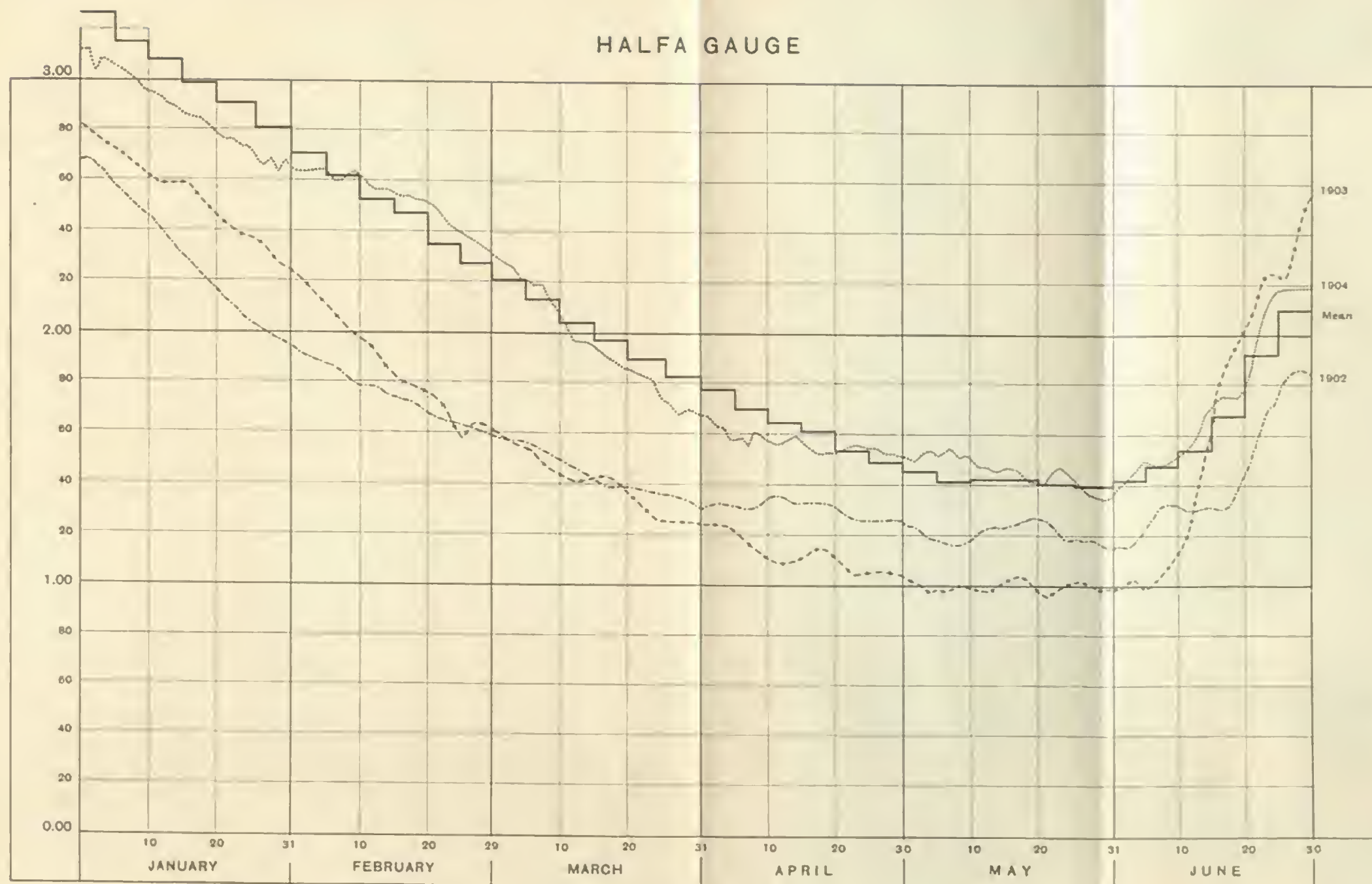
PROVINCE.	LENGTH REVTMENT.			EXPENDITURE DURING THE YEAR.		
	Previously reported.	Added during 1901.	Total to date.	New Revtment.	Repairs.	Total Expenditure.
	M.	M.	M.	L.F.	L.F.	L.F.
4TH CIRCLE.						
Asyut	59,236	—	59,236	—	622	622
Minia	90,072	4,189	94,261	1,677	39	1,716
Beni Suef.	40,329	—	40,329	—	—	—
Total...	189,637	4,189	193,826	1,677	661	2,338
5TH CIRCLE.						
Kena	66,210	2,448	68,658	1,450	733	2,183
Aswan	—	—	—	—	598	598
Total...	66,210	2,448	68,658	1,450	1,331	2,781
GIRGA DIRECTORATE.						
Girga	49,650	3,509	53,159	1,733	101	1,834
Asyut 2nd Section. ...	53,299	3,635	56,934	1,030	219	1,249
Total...	102,949	7,144	110,093	2,763	320	3,083
ASYUT BARRAGE DIRECTORATE.						
Asyut 1st Section ...	—	2,318	2,318	870	51	921
Grand Total...	358,796	16,999	374,895	6,760	2,363	9,123

APPENDIX N.

LIST SHOWING "SHARAKI" AREAS, IN UPPER EGYPT, FOR 1904.

NAME OF PROVINCE	WHOLE SHARAKI.	HALF SHARAKI.	TOTAL.
	FED.	FED.	FED.
Aswan	9,650	3,407	13,057
Kenelt	8,399	5,676	14,075
Girga	1,129	771	1,900
Asyut	2,422	1,913	4,335
Minia	4,493	901	5,394
Beni-Suef	1,265	268	1,533
Ghiza	5,226	1,351	6,577
Total...	32,584	14,287	46,871

HALFA GAUGE



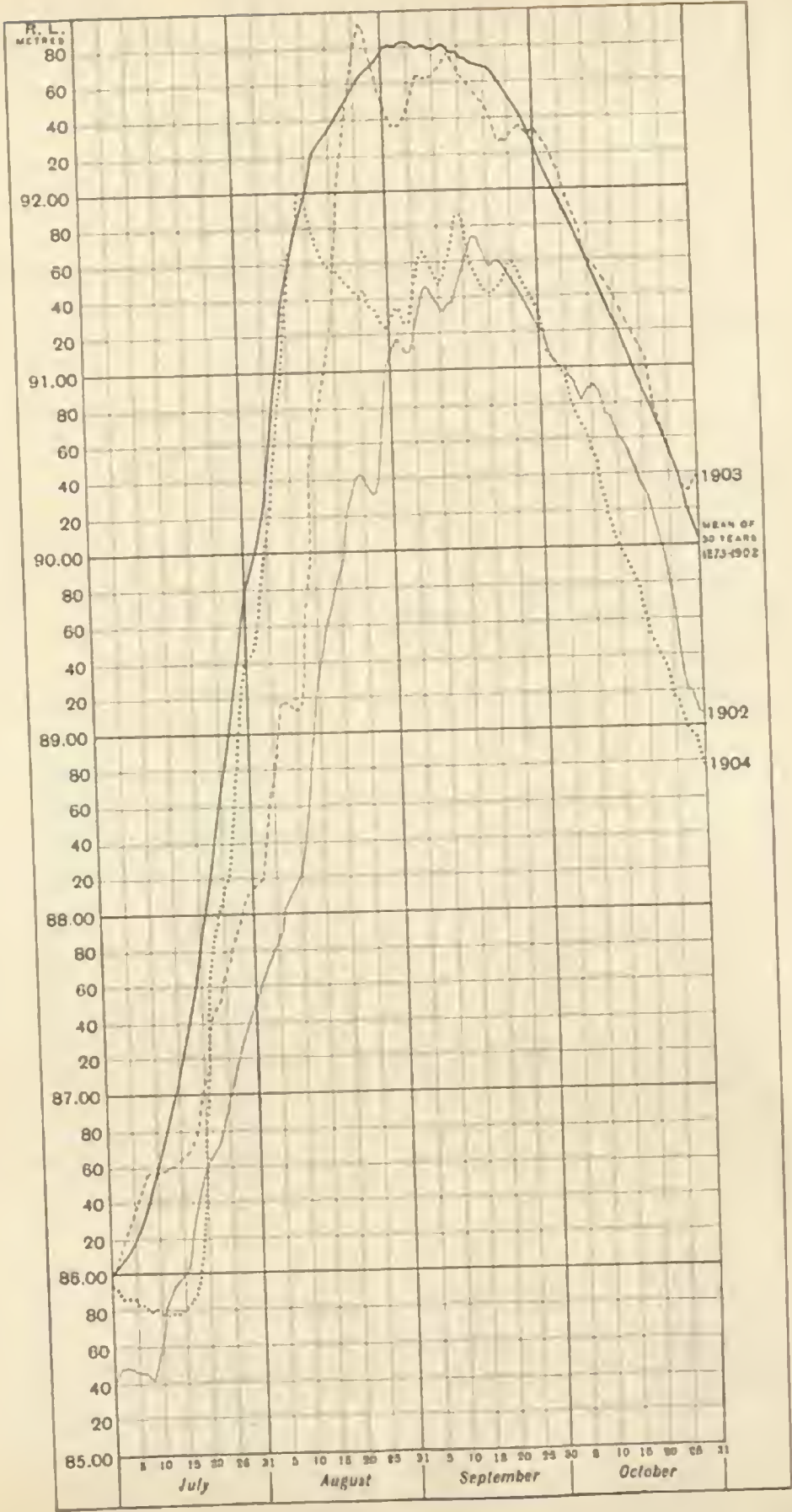
1902 levels very low during summer.

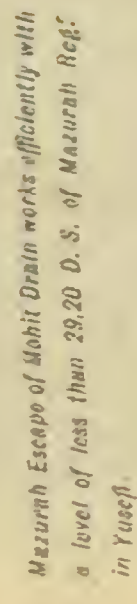
1903 .. still lower

1904 .. good

Mean of 15 years - 1890 to 1904.

ASWAN GAUGE



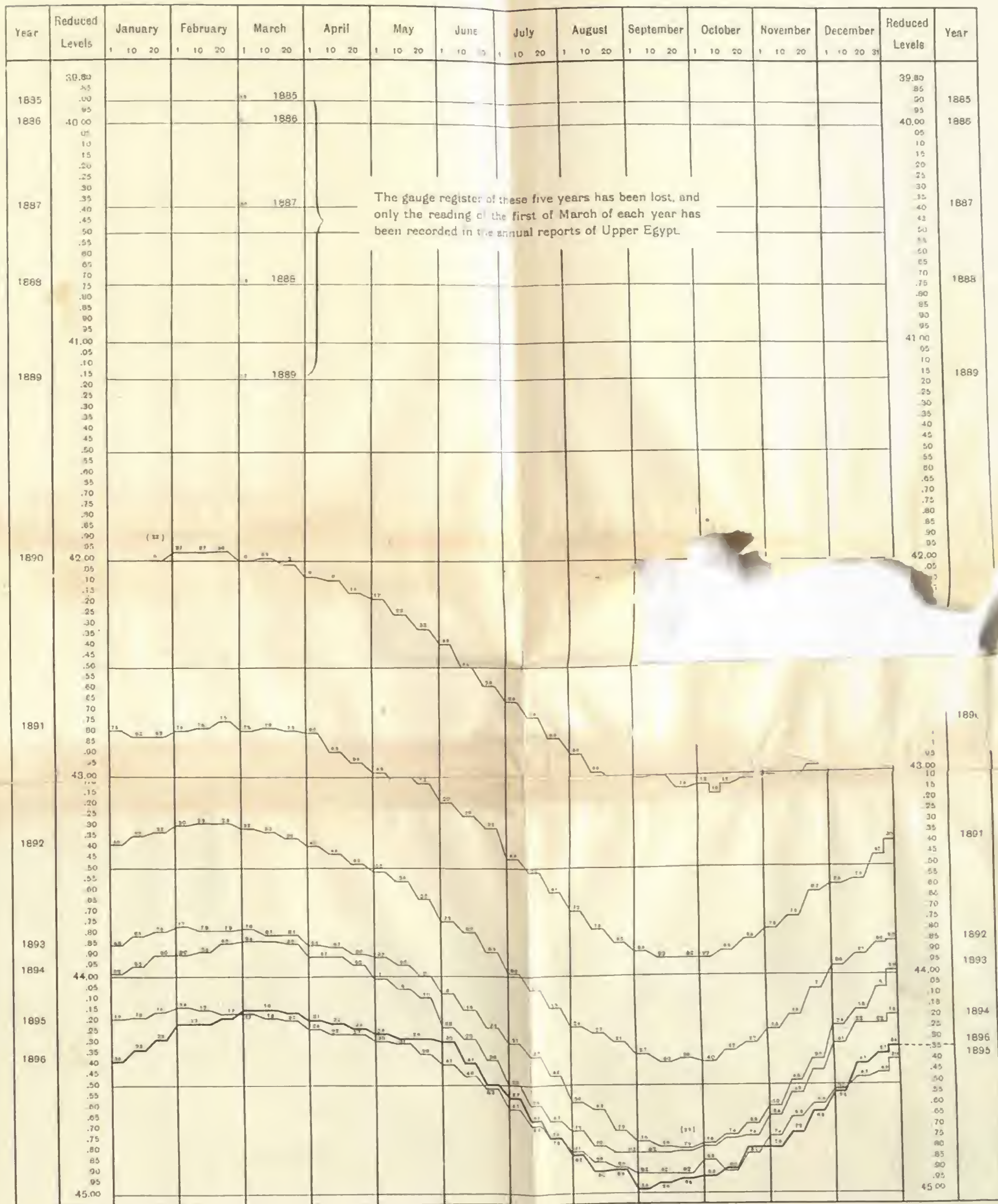




LAKE QARUN LEVELS. 1885 TO 1896.

PLATE IV.

Minus readings below Sea Level.



Maximum Gauges.

Minimum Gauges.

1885 } Not known.
1886 }
1887 }
1888 }
1889 }
1890 — 27th Jan. 41.93
1891 — 20th Feb. 42.75
1892 — 22th Feb. 43.27
1893 — 25th Jan. 43.74
1894 — 26th Feb. 43.83
1895 — 1st Feb. 44.14
1896 — 28th Feb. 44.14

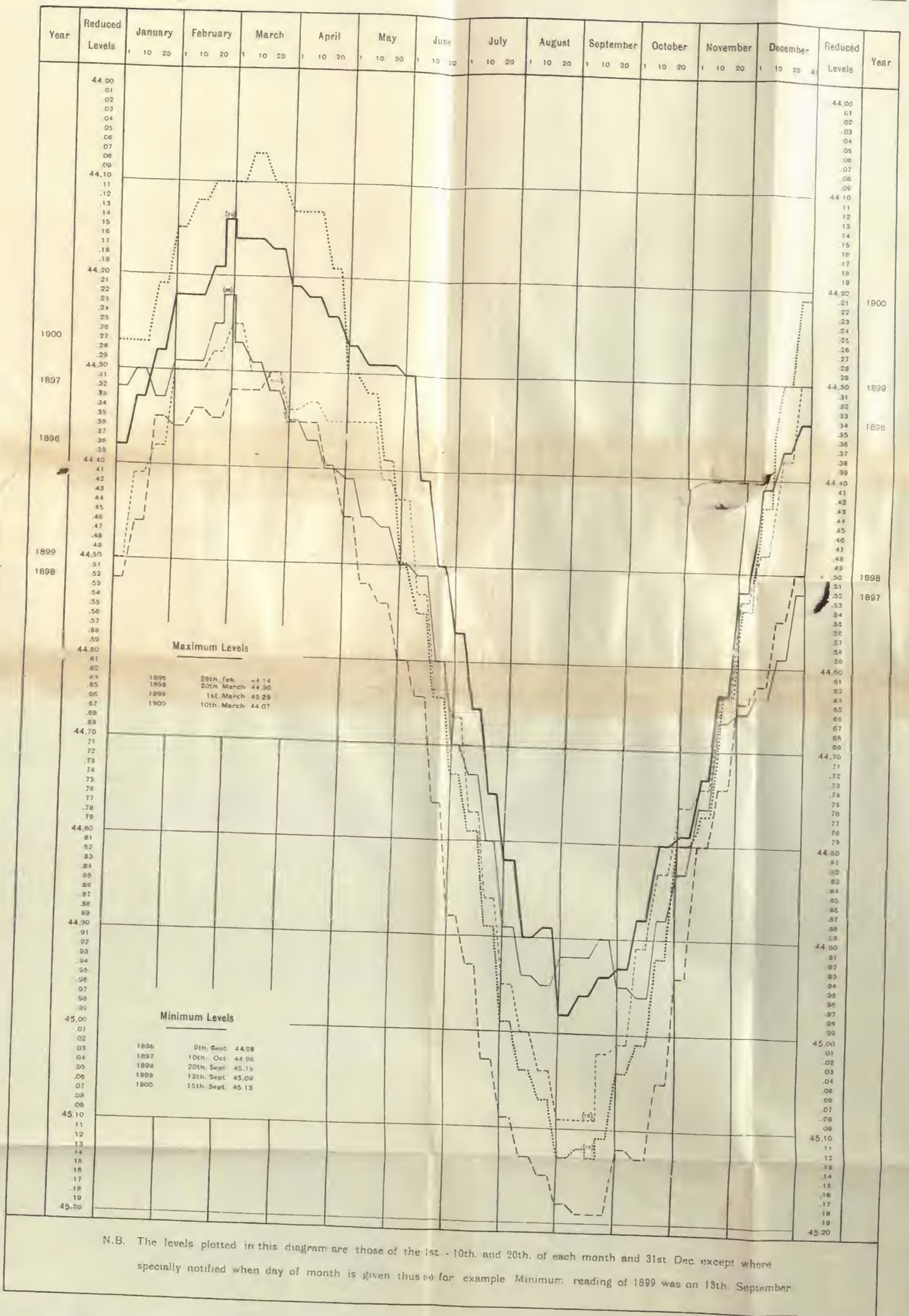
1885 } Not known.
1886 }
1887 }
1888 }
1889 }
1890 — 5th Oct. 43.16
1891 — 1st Oct. 43.02
1892 — 1st Oct. 44.40
1893 — 29th Sept. 44.70
1894 — 25th Sept. 44.82
1895 — 8th Oct. 44.02
1896 — 9th Sept. 44.98

N.B. The levels plotted in this diagram are those of the 1st, 10th, and 20th, of each month and 31st Dec. except where specially notified when day of month is given thus (r) for example Minimum reading of 1890 was on 7th, October.

LAKE QARUN LEVELS. 1896 TO 1900.

PLATE V.

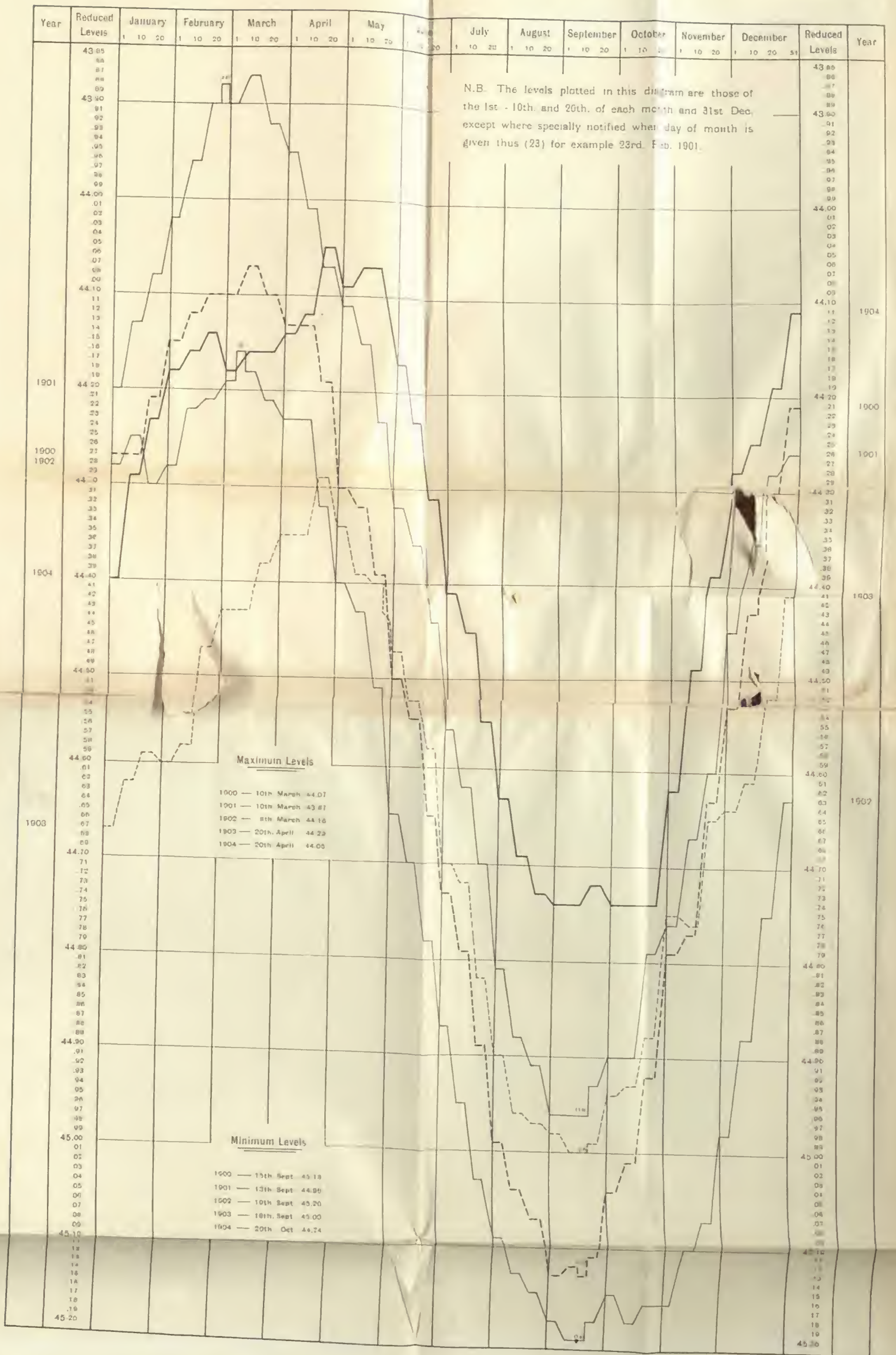
Minus readings below Sea Level.



LAKE QARUN LEVELS. 1900 TO 1904.

PLATE VI.

Minus readings below Sea Level



ADMINISTRATION REPORT
OF THE
IRRIGATION DEPARTMENT IN LOWER EGYPT
For 1904

BY
K. E. VERSCHOYLE,
INSPECTOR GENERAL OF IRRIGATION IN LOWER EGYPT.

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ADMINISTRATION REPORT OF THE IRRIGATION DEPARTMENT IN LOWER EGYPT FOR 1904.

CHAPTER I.

WINTER, SPRING AND SUMMER IRRIGATION

RIVER LEVELS.

The gauge-reading at Halfa on the 1st January was 3.12 metres or 32 centimetres higher than on the same date the previous year. The reading on this gauge on the 1st January, 1899, a year of exceptionally high summer supply, was 3.68 metres, and on the 1st. January, 1900, the year of record minimum summer supply, was 1.93 metres. From the above readings it will be seen that at the commencement of the year the prospects of a good average summer supply were favourable. As a matter of fact the curve indicating the readings on the Halfa gauge between 1st January and end of June almost exactly tallies with the mean curve for the past 15 years.

The minimum reading of 1.35 at Halfa was recorded on the 28th May. The mean minimum reading on this gauge is 1.41.

The rise between the 28th May and 25th June was satisfactory. A bad halt, which had commenced at Khartoum on the 8th June then set in, and the level did not begin to rise steadily again till the 11th July. This set-back of 16 days is about the worst on record, and would have led to trouble, had it not been for the fact that the good supply at the beginning of the year had admitted of the supply stored in the Aswan Reservoir being kept intact up till the 10th May. The extent of the set-back may be judged from the fact that on the 8th July the levels on the Halfa gauge for 1900, the year of minimum low supply and 1904 coincided, and after that date the levels for 1904 fell behind those for 1900 up to the 19th July.

SADDS IN THE ROSETTA AND DAMIETTA BRANCHES.

In view of the favorable level at the beginning of the year, and the fact that the demand of Middle Egypt has not yet nearly reached the figure it will attain, when Sefi irrigation has been extended to the entire basin area of 451,000 feddans included in the sanctioned scheme of conversion works, it was decided not to make a sadd at Faraskour in the Damietta Branch. This sadd had also been omitted in 1903. For the reasons given above the want of the sadd was not felt.

In another three years Middle Egypt and the Fayoum will probably have nearly doubled their present Sefi area, and will require a daily summer discharge of 5 to 6 million cubic metres in excess of that utilized during the past summer, leaving but a small proportion of the water stored in the Aswan Reservoir available for the Delta. When, then, the Middle Egypt conversion works have been completed it will be impossible, even in the most favourable years, to dispense with the 80 million cubic metres which, in my report of last year, I estimated was rendered available by the Faraskour sadd.

The Mehallët El Amir Sadd in the Rosetta Branch was made for the 5th year in succession. Under existing conditions it would be impossible to dispense with this sadd without experiencing serious embarrassment.

The sadd was made as usual with a crest-level of R. L. 3.25 to hold up water to R. L. 2.50. The work was commenced on the 28th January, and the closure was effected on the 1st May. There was water passing the Delta Barrages up to that date, and the closure was purposely delayed with the object of allowing the strong current through the gap to clear out some of the salt water impounded above the sadd.

The sadd was cut on the 1st August. It is estimated that the following cubes were drawn from the pool above it during its existence:

	Cubic metres.
By the 2nd Circle canals	63,282,432
By the Rosetta Canal 3rd Circle	26,620,000
By the Aif pumps	25,707,918
By private pumps	30,000,000
Total	<u>145,610,350</u>

The above cube would be sufficient to give 5 waterings to an ordinary crop of 65,000 feddans between the 1st May and 1st August. The cost of the work was L.E. 9998, so the cost of summer irrigation per feddan of the above area was P.T. 15.4, or, including the cost of

working the Aft pumps, about P.T. 17 per feddan. The sum of L.E. 9998 is not much when compared with the value of 65,000 feddans of summer crop.

ATE PUMPING STATION.

This station worked altogether 61 days and raised a cube of 33,926,390 metres cube; out of this a cube of 8,218,472 metres cube were pumped in the spring, before the closure of the Mehallet El Amir sadd, owing to the reduction of the supply in the Rayyah Behera to admit of the execution of the repairs to Kafr Bulim Regulator.

The expenditure on the station was as follows:

	L.E.
Establishment and maintenance charged to Regular Budget	600
Working pumps charged to Low Nile Credit	260
Contribution from Kom El Akhdar Estate towards working pumps	41
Total	<u>L.E. 901</u>

WINTER AND SPRING ROTATIONS.

The Rayyah Tewfiki Canal was closed from the 25th December to 5th February to admit of building and repairing spurs, meanwhile the Ismaïlia, Sharkawia and Bassusia Canals drew reduced supplies. For about the same period the Rayyah Menoufia was heavily regulated on, most of the branch canals being closed for clearance. In the Rayyah Behera low supplies are run up to the beginning of March, sowings being later in Behera than the rest of the Delta and rainfall more abundant.

As soon as the canals are re-opened after clearance, in the beginning of February, spring rotations commence. These consist of maintaining alternate high and low levels on the regulators in the various canals, so as to afford as much flow irrigation as possible, and at the same time let the land after being watered have a chance of draining. The periods of high and low supply adopted in the various circles vary slightly as shown by the following table:—

Circle.	Period of high levels.	Period of low levels.
	days.	days.
1st Circle	6	12
2nd	4	16
Zifta (Gharbia)	4	16
Zifta (Dakahlia)	No regular system yet followed.	
3rd Circle	5	10

These rotations continue in force till the regular summer rotations begin.

The large increase in free-flow irrigation rendered possible by the adoption of these rotations is greatly appreciated. During the past year the number of cattle available was insufficient to plough the ground for the summer crops, and if a large number of them had had to be employed for working lifting machines the cropped area must have been considerably reduced. Mr. Langley estimates that $\frac{3}{4}$ of the summer crop in his Circle was sown on ground irrigated by free-flow and the proportion in the other Circles was probably about the same.

A great deal of remodelling of canals and construction of water-course outlets is required in Dakahlia to make distribution by means of alternate high and low levels on regulators work successfully. Where outlets are excessive in size or are represented by open cuts, high levels mean that the upper outlets of a reach draw too much water, flooding the country and choking the drains, while the lower outlets do not get their share, or, if they do, the general waste of water is great. The question of outlets and improvement of canals is being taken up seriously in Dakahlia at present.

SUPPLY FROM ASWAN RESERVOIR

The original programme for emptying the Aswan Reservoir was as follows :—

	cubic metres per day
From 10th May to 20th May... ..	2,000,000
From 21st May to 30th May... ..	10,000,000
From 31st May to 19th June... ..	20,000,000
From 20th June to end	25,000,000

The actual programme worked to was as follows:—

	cubic metres per day
From 10th May to 20th May	4,000,000
From 21st May to 5th June	10,000,000
From 6th June to 10th June	20,000,000
From 11th June to end	35,000,000

The pace of emptying was accelerated on seeing the early and satisfactory rise at Khartoum. In the result it would have been better to have adhered more or less closely to the original programme. There is no harm done if the beginning of the flood does reach Aswan before the reservoir is empty, as the discharge to be passed, even with a good deal of water in the Reservoir, must still be much less than will have to be passed through the dam by about the end of July, when the flood is approaching its maximum.

The effect of completing the emptying of the Reservoir by the end of June, combined with the long halt in the rise, was that the supply reaching the Delta Barrage fell from 71.8 millions on the 15th July to 69 millions on the 22nd July. This was not a serious drop seeing that last year, when the rise was very favourable, the discharge reaching the Barrage on the same date was 75.5 millions, but it would have been better to have delayed the emptying by about a week so that the supply should have gone on increasing without a break, as the demand becomes more intense daily from the 10th July onwards.

During the past summer owing to the cattle plague, and the consequent great delay in harvesting the winter crop, full advantage could not be taken of the abundant supply during June, which made the demand during the latter half of July all the more severe.

SUPPLY REACHING THE DELTA.

The Rosetta Barrage was tightly closed on the 6th April. The Damietta Branch was not quite dry till the end of May, and a small supply was passed down it between the 22nd June and 17th July, when it was again tightly closed till the 27th July, after which date the regular rise reached the Delta Barrage, and both the river branches began to fill. The small supply sent down the Damietta Branch at the end of June was very useful in bringing the northern river-pumps into action by sweetening the river.

The supply reaching the Barrage was 49.6 millions on the 8th April; it continued very constant and had only fallen to 46.4 millions by the 15th May. On the same date last year it was only 34.1 millions. The discharge of 23rd May had begun to be affected by the reservoir water and amounted to 48 millions.

On the 22nd June the critical level of 15.50 (the level at which escape down the river branches commences) was reached upstream of the Barrage. During the past four years, i.e., since the barrage weirs came into operation, this level was reached on the dates indicated below.

Year.	Level of 15.50 Upstream Delta Barrage reached on.
1900... ..	July 30th.
1901... ..	July 22nd.
1902... ..	July 30th.
1903... ..	July 3rd.

As the demand of Middle Egypt increases the date of reaching the level of 15.50 above the Barrage will tend to get later, or in other words the average summer supply reaching the Delta will diminish unless some means of increasing it be found meanwhile.

The discharge on the 22nd June was 61 millions and by the 15th July it had reached 71.8 millions. At this point the slight fall alluded to above occurred, and the discharge on 22nd July had fallen to 69 millions. It, however, began to rise again the following day, and on the 1st August had reached 77.3 millions.

Last year the Delta rejoiced greatly with an average discharge of 47 millions per day between the 1st May and 15th July. During the past summer for the same period the average discharge was 58 millions per day.

There were a few grumbles at the end of July from those whom the good supplies of May and June had induced to put in too much summer rice. Before the Barrage weirs or the Reservoir came into action the Delta had to be content with a discharge of 40 to 42 millions per day at the end of July so with an average discharge of 70 millions per day throughout the month, and, so far as available statistics go, no great increase in cropped area, there cannot have been any severe shortage of supply. No matter what may be the supply available during the last 10 days of July and 1st week of August, there will still be a cry for more as every cultivator would then like to water practically his whole culturable area at once.

DISTRIBUTION OF SUPPLY.

In the report for 1902, calculations are given showing that the correct proportions of the summer discharge reaching the Delta to be allotted to the several Circles were as follows:—

1st Circle (Kalionbia, Sharkia, Dakahlia)...	43%
2nd Circle (Menufia, Gharbia) ...	34%
3rd Circle (Behera and a small fraction of Gizeh)	23%

These percentages were arrived at by taking the area of summer crops in each province for 1901, one feddan of rice being considered equivalent to two feddans of ordinary summer crop, and assuming that the Circles drew the following daily discharges from the river-branches below the barrages:—

	cubic metres	feddans
1st Circle ...	1,000,000 capable of irrigating	46,000
2nd Circle ...	2,000,000 capable of irrigating	92,000
3rd Circle ...	500,000 capable of irrigating	23,000

As the 1st and 2nd Circles have now been split up into three circles it is more correct to take the cropped areas and discharges by provinces. The relative areas in the provinces have altered considerably since 1901 Menoufia, Gharbia and Behera having increased their cropped areas more rapidly than the others. It is also I think more accurate to take the daily supply drawn direct from the river as follows:—

	cubic metres
Kalioobia, Sharkia, Dakahlia	500,000
Menoufia, Gharbia	2,000,000
Behera	900,000

These discharges would irrigate the following areas of ordinary summer crop.

	fekdans
Kalioobia, Sharkia, Dakahlia... ..	20,000
Menoufia and Gharbia	80,000
Behera	36,000

The areas of summer crops in the several provinces for 1904 dependent on the canals were then as follows:—

	fekdans
Kalioobia, Sharkia, Dakahlia 669,000—20,000 =	649,000
Menoufia, Garbia 668,000—80,000 =	588,000
Behera and portion of Gizeh 366,000—36,000 =	330,000

The correct proportions of the summer supply reaching the Delta for each group of provinces last year should therefore have been as follows:—

Kalioobia, Sharkia, Dakahlia ...	41.4% say 41%
Menoufia, Gharbia	37.5% say 38%
Behera and Gizeh... ..	21.1% say 21%

The supply was so good last summer that Inspectors did not always draw the discharges they were entitled to on the old basis of 43, 34, and 23% respectively. Behera particularly might often have drawn a larger supply. The following table shows some of the weekly discharges and compares them with the correct discharges worked out on the above basis of distribution.

DATE	Kalioobia, Sharkia and Dakahlia.		Menoufia and Gharbia.		Behera and Gizeh.	
	Measured Discharge.	Correct Discharge	Measured Discharge.	Correct Discharge.	Measured Discharge.	Correct Discharge.
1st May ...	21,291,000	19,867,686	17,426,707	18,413,952	9,670,607	10,176,131
15th May ...	19,516,027	19,038,815	17,216,067	17,645,731	9,701,042	9,751,588
1st June ...	23,702,282	22,196,818	17,957,891	18,719,020	8,600,429	10,344,727
15th June ...	23,365,972	22,836,718	22,520,237	21,265,739	9,813,105	11,696,855
1st July ...	26,403,079	24,117,657	22,270,428	22,352,951	10,170,049	12,352,946
15th July ...	32,839,870	29,445,614	26,597,643	27,291,057	12,381,059	15,081,900

Kalionbia, Sharkia and Dakahlia were generally taking considerably more than their share, and Behera and Gizeh a good deal less. The level upstream of the Barrage reached 15.50 on 22nd June. Once this level is reached it is impossible to distribute exactly as there is no reason for not allowing all the canals to take as much as they can draw with the level prevailing, and the latter rises automatically with the amount of water being escaped. The Inspector of 3rd Circle could have had more water during June if he wished, but did not require it. The Behera canal system is much more compact than that of Sharkia and Dakahlia, so the wastage is considerably less. Between the 22nd June and 18th July there was some escape down the Damietta Branch, which means that the canals were taking all they required. As explained before lack of cattle prevented cultivators taking advantage of the abundant supply in June and 1st half July to put in early dhourra crop.

The total discharge received by Kalionbia, Sharkia and Dakahlia was divided between the 1st and Zifta Circles at Mit Ghamr and Seneita regulators. The respective areas of ordinary summer crop were as follows:—

	feddans
1st Circle	358,271 = 53.6 %
Zifta Circle (Dakahlia)	310,770 = 46.4 %

The bulk of the rice east of Damietta Branch was in Dakahlia, a fact which swells its crop area, each feddan of rice being taken as equivalent to 2 feddans of ordinary summer crop. The mean total discharge entering the three provinces during June was 24 millions per day. Of this the share of Zifta Circle would be $24 \times 0.46 = 11,040,000$ metres cube per day. The mean discharge it actually received was 10,035,000 metres cube per day. It is natural for the northern province with its cooler climate and stiffer soil to show a higher duty than the more southerly provinces of Kalionbia and Sharkia with their higher temperatures and more porous soil.

The Gharbia portion of Zifta Circle got its summer supply below Santa regulator on the Bahr Shibin. The respective areas of ordinary crop were as follows:—

	feddans
2nd Circle	390,821 = 71 %
Zifta Circle (Gharbia)	160,728 = 29 %

The mean total canal discharge drawn by Menutia and Gharbia during June was 21 millions per day. Of this the share of Zifta Circle should be $21 \times 0.29 = 6,090,000$ metres cube per day. The mean discharge actually delivered below Santa Regulator during June is given as 5,000,000 metres cube per day, and about 1,000,000 metres

cube per day were passed forward to East Gharbia through other canals taking off above Santa, so the division was pretty correct.

SHARAKI DECREE.

The decree prohibiting the irrigation of fallow land until a date to be notified known as the "Sharaki Decree" was issued on the 12th April to take effect from the 26th May. The prohibition was removed on the 15th June.

In 1903 the prohibition was removed on the 1st July, and in the three years 1900 to 1902 generally about the middle of July. The early removal of the prohibition was not taken advantage of to any extent probably owing to the fact that, by reason of the scarcity of cattle, the harvesting of the winter crops had not been completed.

SUMMER ROTATIONS

It was at first intended to impose a 21-day rotation, which means that all outlets and machines on each section of a canal are allowed to draw water for a period of 6 days, and are then closed or stopped for a period of 15 days.

Now in the previous year the total area of ordinary summer crop to be dealt with, assuming each feddan of rice equivalent to two feddans of ordinary crop, was 1,538,133 feddans. Previous experience has shown, assuming that our figures for areas of crops are correct, that a discharge of 555 metres cube at the head of the Delta is required to water one feddan of summer crop. Our areas are known to be too small so the figure of 555 metres cube is too high but must be used till more accurate crop statistics are forthcoming, and for the purposes of this calculation if each feddan in the crop returns actually represents say 1.4 feddan it does not matter.

Assuming that the areas of crop in 1904 would be practically equal to those of 1903 the discharge required to have made a 21-day rotation suitable would have been $1,538,133 \times \frac{25.3}{21} = 41$ millions metres cube per day in round figures. Of this cube the river branches below the Delta barrages would have yielded 3 millions metre cube per day leaving 38 million metres cube as the discharge required by the canals at the head of the Delta.

Now the mean discharge carried by the said canals during the first half of May was almost constant at 47 million metres cube per day, and was beginning to increase under the influence of the reservoir water, so there was evidently no need for a 21-day rotation on 15th May or for any rotation except the ordinary spring rotation till the demand became brisker in June.

It was therefore decided to put off the imposition of rotations for a fortnight, and then to start with a 16-day rotation, whereby periods of 8 days working would alternate with periods of 8-days stoppage. On the canals irrigating rice the working days were 4 or 5, followed by 4, 5 or 6 days stoppage according to local conditions. Such a rotation would require a daily discharge in the canals at the head of the Delta of $(1,538,133 \times \frac{2.5}{10} = 3,000,000)$ cubic metres = 50 million cubic metres in round figures. The discharge in these canals on the 1st of June was actually 49 million metres cube, and was likely to increase, so a 16-day rotation met the case very well.

As the supply increased the rotations were relaxed, as shown in the table which follows, and were removed generally altogether on various dates between the 3rd and 16th August.

In the portion of East Gharbia included in Zifta Circle the only canal on which actual stoppage was enforced was the Cherbine Canal, which was divided into two sections with periods of working and stoppage of 4 days each. On the other canals the spring rotation of 4 days high and 16 days low levels on regulators was adhered to. This was virtually a 20-day rotation as hardly any lifting machines worked during the low turns.

The following table shows the nature of the rotations actually enforced and the time each lasted.

CIRCLE	Province or Canal.	Period of enforcement.	NATURE OF ROTATION.			
			Ordinary Crops.		Rice.	
			W	S	W	S
1st.	Kalionbia and Ismailia Canal...	1st June to 29th June...	8	8	—	—
"	Sharkia and Dakahlia...	1st June to 5th July ...	8	8	5	4
"	"	6th July to 3rd August...	12	4	5	4
"	Seven canals in Sharkia	1st June to 7th Sept. ...	—	—	5	4
2nd	Menoufia and West Gharbia	1st June to 11th August.	8	8	4	4
3rd.	South Behera	1st June to 12th August.	8	8	4	4
"	Mahmudia System	6th June to 16th August.	—	—	5	5
Zifta	Dakahlia generally	1st June to 2nd July ...	8	8	4	4
"	"	3rd July to 12th August.	8	4	4	4
"	Bahr Seghir and Sharkia via Faraskour Canal.	1st June to 30th June...	—	—	4	6
"	Bahr Seghir and Sharkia via Faraskour Canal.	1st July to 12th August.	—	—	4	4
"	East Gharbia generally	Four days high levels followed by sixteen days low levels on regulators maintained throughout ...	—	—	—	—
"	Cherbine Canal	21st June to 12th August	—	—	4	4

The seven canals in Sharkia on which rotations were maintained up till the 7th September were the following :—

- Saïdia Canal and branches from the head to Abu Shalabi.
- Hannt Canal from Bussa to the road-bridge.
- Samaana Canal and branches from the head to kilometre 14 (Abu Koh branch excepted).
- Amin Pasha Canal.
- Moralia Canal from the head to the boundary of Mustapha Pasha's land.
- Mustapha Pasha El Arab Canal.
- Saarana Canal from the head to the regulator.

The reason for the special rotations on these canals and also on the Bahr Seghir and Sharkawia-Paraskour canals was that they are not provided with proper outlets proportionate in size to the areas served, so unless rotations are retained longer, and are of a more severe nature than on other canals with superior systems of outlets, great waste of water ensues and supplies cannot be forced to the tails. Considerable progress has been made with construction of new outlets.

Generally speaking the rotations were maintained about a month longer than last year, as their removal at the beginning of July last caused a certain amount of embarrassment. As it was the supply was not quite sufficient during the last 10 days of July, till the Zifta Barrage came into operation, and the Rayyuh Abbas began to feed East Gharbia.

DUTY OF WATER.

The most suitable period on which to calculate the summer water-duty appears to be from the 1st May to the 30th June. It is true that the prohibition to irrigate Sharaki land was removed on the 15th June but, as explained before, practically no advantage was taken of its removal till well into July. The area under crop during May and June was therefore almost constant. The discharge reaching the Delta between the 1st May and 8th June was also very constant, and its increase between the 8th and 30th June was only 20%. The mean discharges of the main feeder canals supplying the Delta deduced from the mean gauge-readings for the selected period of 61 days were as follows.

CANAL.	Mean water level.	Corresponding discharge.
	R. L.	C.M. per day.
Rayyah Behera	14.28	9,712,000
Rayyah Mennia	14.65	18,790,000
Rayyah Tewfik	14.44	11,828,000
Ismailia Canal	14.77	2,640,000
Sharkawia Canal	14.71	2,380,000
Bassusia Canal	14.88	1,517,000
Total representing the mean discharge with drawn by the Canals above the Delta Barrage between the 1st May and 30th June		49,897,000

The areas under summer crops as furnished by the Ministry of Finance are as follows :—

PROVINCES.	Summer rice.	Summer crops other than rice.
	FEDDASS.	FEDDASS.
Kalioubia, Sharkia, Dakahlia	71,670	520,441
Mennia and Gharbia	28,860	493,829
Behera and portion of Gizah.	40,605	284,970
Totals	141,135	1,299,240

The supply of water available for irrigation during the selected period of 61 days was as follows :—

Total discharge of 6 canals	Cubic metres
49,897,000	
Lifted by river pumps below the Barrages	2,500,000
Taken from Melallet El Amir Pool	1,528,000
Total	53,925,000
Deduct for Alexandria	45,000
Deduct for Port Said	100,000
	145,000
Balance... ..	53,780,000

Assuming, as usual, that rice consumes double the amount of water that other summer crops do, the general duty is arrived at as follows :—

$$\frac{53,780,000}{141,135 \times 2 + 1,299,240} = 34 \text{ cubic metres.}$$

A feddan of rice therefore consumed 68 cubic metres per day and a feddan of other summer crops 34 cubic metres per day. The areas of rice might probably be increased by 50 % without exceeding the true figure, and the areas under other crops by 10 % to 15 %. For instance the figures arrived at by the Irrigation officers in Behera are:—

Rice	72,000 feddans
Cotton	291,000 ..

while for the same Province the figures furnished by the Ministry of Finance are:—

Rice... ..	40,605 feddans
Cotton	251,888 ..

The duty is probably the lowest ever recorded. There has not been such a good summer supply in the river since 1899 and, as remarked before, Lower Egypt received about 70 % of the reservoir-water; when she only receives 30 % the case will be different.

The following are the calculations for the summer water-duty worked out by each circle separately. As Zifta Circle was only created during the year the observed discharges at the points of division of supply between it and the 1st and 2nd Circles in Dakahlia and Gharbia are rather scanty, and the division of the cropped areas between the circles is also not accurately known, facts which rather depreciate the value of the calculations which, however, I shall give for what they are worth.

DUTY OF WATER—1ST CIRCLE, AND ZIFTA CIRCLE (DAKAHLIA).

The areas under summer crop in the new 1st Circle and Zifta Circle (Dakahlia) were as follows:—

	Rice.	Other Summer Crops.
	Feddans.	Feddans.
Kalioobia, Sharkia and Dakahlia	71,670	520,441
In portion of Dakahlia attached to Zifta Circle.	51,300	202,170
New 1st Circle... ..	17,370	318,271

The mean summer discharge entering the three Provinces through the Rayyah Tewfiki, Ismailia, Sharkawia and Bassussia Canals, was, as given in the preceding table, 21,765,000 cubic metres per day. Out of this total Mr. Langley gives the following as the mean discharges passed on to the Zifta Circle.

	Cubic metres
Munsuria Canal below Samayta Regulator	7,429,175
Bahia " " Barham Touth	2,184,428
Bizrari " "	200,000
Om Galagil " "	264,000
Om Salama " "	300,000
Total	<u>10,377,603</u>

Hence the mean canal discharge utilized by the 1st Circle was $(21,765,000 - 10,377,603) = 11,387,397$ cubic metres per day. Adding 225,000 m.c. per day for river-pumps and deducting 100,000 metres cube per day for supply of Port Said and Suez we are left with an available discharge of 11,412,397 cubic metres per day.

From the above data the general duty in the 1st Circle works out as follows :—

$$\frac{11,412,397}{17,370 \times 2 + 318,271} = 32.3 \text{ cubic metres}$$

The discharge utilized by the Zifta Circle in Dakahlia being 10,377,603 cubic metres per day plus 250,000 cubic metres for river-pumps or a total of 10,627,603 cubic metres per day, the general duty becomes

$$\frac{10,627,603}{51,300 \times 2 + 202,170} = 34.2 \text{ cubic metres}$$

Mr. Ireland, who assumed a mean discharge of 10,335,615 cubic metres per day, arrives at a general duty of 33.2 cubic metres.

DUTY OF WATER IN 2ND CIRCLE

ZIFTA CIRCLE (GHARBIA).

The areas under summer crop in the new 2nd Circle and Zifta Circle (Gharbia) were as follows :—

	Rice	Other Summer crops
	Faidans.	Faidans.
Menoufia and Gharbia	28,860	423,829
East Gharbia Zifta Circle	18,289	124,150
New 2nd Circle... ..	10,571	369,679

The mean discharge entering the two provinces was as follows:—

	Cubic metres per day
Rayyah Menafia	18,790,000
River pumps	1,500,000
From Mahallet El Amir Pool... ..	688,000
Total	<u>20,978,000</u>

Of the above total discharge there were 5,000,000 cubic metres passed on to East Gharbia, below Santa Regulator on the Bahr Shibin, about 1,000,000 cubic metres through other branch canals, and the river pumps in East Gharbia gave 250,000 cubic metres more, making a total discharge for East Gharbia of 6,250,000 cubic metres per day. Deducting this from the total discharge given above we are left with 14,728,000 cubic metres per day, as the discharge utilized by the new 2nd Circle.

From the above data the general duty in the 2nd Circle works out as follows:—

$$\frac{14,728,000}{10,571 \times 2 + 363,679} = 37.6 \text{ cubic metres}$$

and the duty in East Gharbia becomes

$$\frac{6,250,000}{18,289 \times 2 + 124,150} = 38.8 \text{ cubic metres.}$$

DUTY OF WATER IN 3RD CIRCLE.

The areas under summer crop were:—

	Fekdans
Rice	40,605
Other crops	<u>284,970</u>

The available supply was:—

	Cubic metres per day.
From Rayyah Behera	9,742,000
From river-pumps and Mahallet El Amir Pool	1,160,000
Deduct Alexandria water-supply	45,000
Balance	<u>10,857,000</u>

The general duty was therefore:—

$$\frac{10,857,000}{40,605 \times 2 + 284,970} = 29.7 \text{ cubic metres.}$$

The following table compares the above results :—

CIRCLE.	General duty	Whee duty
	Cubic metres per feshdan	Cubic metres per feshdan.
Lower Egypt as a whole	34	68
1st Circle	32.3	64.6
2nd	37.6	75.2
3rd	29.7	59.4
Zifta Circle Dakahlia... ..	34.2	68.4
Zifta Circle Gharbia	28.8	57.6

The agreement between the several circles would doubtless have been much closer had the supply been shorter, and each circle kept to its allowance. As a matter of fact Inspectors were often not taking their full allowance.

CROPS.

The yield of cotton has been very poor. The total crop will probably be slightly under 6,000,000 kantars. With the increased area under cotton in middle Egypt, a crop of over 7,000,000 kantars might have been expected.

The crop had a series of ills to contend against. To start with the ground, owing to the paucity of cattle, was only half tilled, two ploughings replacing 4 or 5 in many cases. Worm and cold killed a quantity of the first and even second sowings, and made the crop late. Towards the end of July worm became very prevalent, particularly in Sharkia and Behera, and large areas were stripped clean. Autumn fogs and worm in the bolls completed the chapter of disasters.

According to one agricultural expert the poor yield in many cases was due to the land having been called on to carry a cotton crop too frequently the last few years owing to the high prices. The case of one large estate is quoted, on which the rule of one third area only under cotton is rigorously adhered to, and on which the yield obtained in the past season has shown a very slight falling off.

In most cases heavy waterings were resorted to to combat the worm. This heavy irrigation is considered by many to have done more harm than

good. I understand that a few cultivators in Dakahlia tried the experiment of leaving the crop without water for 30 days with considerable success.

On Prince Toussoum's estate at Wardan, all eggs were carefully picked off the leaves of 400 feddans of cotton at a cost of about L.E. 1.00 per feddan. The result was a yield of 3 kantars per feddan more than given by adjacent cotton similarly attacked, so in this case the timely expenditure of L.E. 400 averted a loss of over L.E. 4,000.

The winter and other summer crops and also the flood crops were all good.

Appendix E gives the statement of crops furnished by the Ministry of Finance.

The following statement gives the crop areas of the last three years obtained from the same source.

YEAR.	WINTER CROPS.		SUMMER CROPS.		SILK CROPS.		GARDENS.	TOTAL.
	The Delta.	Gizeh.	The Delta.	Gizeh.	The Delta.	Gizeh.		
1902	2,067,039	136,646	1,366,009	45,820	1,184,635	31,200	11,235	4,845,581
1903	2,051,977	131,476	1,412,537	41,661	1,149,001	29,245	12,348	4,834,251
1904	2,005,742	141,726	1,438,612	46,481	1,191,281	38,659	13,049	4,875,548

I understand that the figures are arrived at by asking each cultivator when he comes to pay his land-tax what areas he has under different crops. The areas so recorded are extraordinarily constant. Reliable figures on the subject are very badly needed. Without such figures an irrigation officer is working very much in the dark.

The cultivated areas for the past three years are as follows :—

YEAR.	The Delta.	Gizeh.	Total.
1902... ..	3,070,789	180,986	3,251,775
1903... ..	3,069,214	172,101	3,241,314
1904... ..	3,073,758	181,877	3,255,635

The uncultivated area in Gizeh Province fluctuates in a peculiar manner, being returned in 1902 as 11,753 feddans, as 28,159 feddans in 1903, and as 16,344 feddans in 1904.

CHAPTER II.

FLOOD IRRIGATION.

The flood was a very feeble one, and little better than that of 1902. The level upstream of the Barrage reached 15.50 on 22nd June under the influence of the reservoir water. The reservoir was emptied by the end of June, and during July the rise came so slowly that the level at Aswan fell slightly between the 28th June and 18th July. Up till the 27th July the canals above the Delta Barrage were absorbing the whole supply of the river with a constant level upstream of the Barrage of 15.50. From this date water began to pass the barrages, and the upstream level to rise, as the river branches began to fill, in accordance with the usual rule. An up-stream level of 16.29 was reached on 21st August and remained nearly constant, with slight variations till the 7th October. The barrages were never fully opened till the canals were closed in December.

FLOOD ROTATIONS.

Flood rotations commenced generally between the 15th August and 1st September. As usual, to start with, they consisted of alternate 7-day periods of high and low levels above regulators. As the supply and demand diminish the period of high supply is shortened and of low supply lengthened till, late in the autumn, the former is reduced to 4 days and the latter increased to 16 days.

These rotations as a rule are popular. I have received one complaint as to their effects at the tails of a few canals.

REGULATION ON ZIFTA BARRAGE.

An attempt was made to construct a sand sadd downstream of the barrage, as was done in 1903, but it was carried away before completion by the small discharge passed down the Damietta branch on 22nd June. The absence of this sadd delayed the date on which the 1st and Zifta Circle canals could be fed from above the barrage to the 31st July.

Last year the Rayyah Abbas began to work on the 14 July. This delay was a loss as the demand during the last half of July is always intense and it was only during this period that any tightness of water was experienced last summer. In fact it may be said that the past summer's experience emphasised the necessity of a small subsidiary weir below the barrage in order to obtain the highest possible duty from the latter.

From the 31st July to the 20th November, the Rayyah Abbas worked steadily. The barrage was never fully open during this time though the head on it was insignificant and was always under 2 metres. On the 20th November the barrage was fully opened as there was no object in keeping a head on it any longer, and it was preferable to pass the supply down the main canals from the head of the Delta in the interests of navigation. During the above period the levels above the barrage, admitted of feeding the Mansuria Canal for 57 days between August 13th and October the 8th; it was not, however, always found necessary or convenient to do so. The immediate relief experienced when the canals above this barrage begin to draw at the beginning of flood, and provide for about 24 % of the flood irrigation of the Delta, makes one wonder how we got on without it.

BASIN IRRIGATION GIZEH PROVINCE.

Filling west Gizeh basins.—The Girga head began to draw water on the 1st August, and the Abu Nuuros escape about the same date. A level of 22.40 'on the Maarqab regulator was reached on the 4th August, and was maintained till the 7th October, after which it fell till Komi escape was opened on the 5th November. Water reached the end of the Manshia basin by 16th August. The filling of Hod Iswid was purposely delayed owing to the large cotton crop in it. When Komi escape was opened the basins were all quickly brought up to T.R. levels by the following dates:—

Basin	Date of reaching T.R. level.
Maarqab	8th November.
Taloua	13th "
Dashar... ..	14th "
Saqqara... ..	14th "
Shabranout... ..	21st "
Manshia... ..	21st "
Iswid	22nd "
All hoshahs... ..	Between 8th and 20th November.

Sarf of west Gizeh basins.—The north Nikla sadd was cut on 20th November, the Rayyah Behera head having previously been fully opened.

The north Iswid basin was thus partially filled before the south Nikla sadd was cut on 23rd November. The north basin thus got a better soaking than usual, and the rush into the basin when the south sadd was cut was considerably reduced, which prevented the north cut opening out to the usual extent, thus economising earthwork.

The Abu Nimros escape was also opened on 23rd November. The sarf was completed by the 5th December, a late date but then the flood was a very poor one.

Filling east Gizeh basins.—The Khashab Canal began to draw water on the 6th August. Ghamaza regulator was kept closed and T.R. level was reached on it early in September. The four northern basins were fed from the Ghamaza feeder up till the 30th October when Ghamaza regulator was opened to top them up.

South basin fell short of T.R. L. by 1.20 metres, Attieh basin by 31 centimetres, Saff basin by 30 centimetres, and Mmasara basin by 50 centimetres; the other four basins all reached T.R.L. by the middle of November.

Sarf of east Gizeh basins.—There was very little water to sarf. The Der El Tin Escape was opened on 7th November and all the basins were dry by the end of the month.

Sharaki areas.—The sharaki area in east Gizeh was 6,619 feddans whole and 1,410 feddans half Sharaki, a very satisfactory result seeing that in 1902, a year of very similar flood, the Sharaki area was 20,000 feddans. The remodelling of the Khashab Canal was the reason of the improvement.

There was no Sharaki in west Gizeh, special measures having been taken to flood the hoshulis on the Nile sahels. In the Delta there was a Sharaki area of 905 feddans on the river sahels, for the irrigation of which special measures were taken.

FLOOD WATCHMEN.

The following statement shows the number of flood watchmen called out and the number of days spent by them on guard:—

CIRCLE.	Number of men called out.	Number of days spent on guard.	Number of men out for 100 days.
1st Circle	435	13	56
2nd Circle	812	4	32
Zifta Circle	527	25	132
Gizeh			
Totals	1,774		220

The number of men out for 100 days in 1902, a year of similar flood, was 110. I would prefer to see the numbers somewhat greater. It is a wise precaution to call out a few men in August to protect exposed banks with libsh. When this has been done the bulk of the men can be let go if the flood shows no signs of developing. Exposed banks suffer even during the lowest floods if not protected, so a certain amount of such protection should always be done.

LAKE VICTORIA NYANZA GAUGES.

The following statement shows the corrected readings on Kisumu gauge on the 1st October since 1896, and the mean readings for each year for which a complete record exists. The figures given have been arrived at from those given in last year's report by taking the reading on 31st December, 1903, as 1.50 metres, and adding 0.65 metre to the previous readings to bring them into accordance with that value.

YEAR.	Gauge-reading on 1st October.	Mean Gauge-reading for the Year.
1896	1.39	1.578
1897	—	—
1898	1.63	—
1899	1.14	1.398
1900	0.99	1.041
1901	0.99	1.158
1902	0.84	0.822
1903	1.62	1.381
1904	1.50	1.560

CHAPTER III.

DRAINAGE.

As will be seen further on in Chapter V., the amount spent on maintaining drains during the past year was double that spent in 1903. As the budget allotments have been increased I hope to be able to record a further increase in expenditure on this object next year.

The question of keeping down weeds was taken up more or less vigorously in three out of the four Delta Circles and drains worked more freely in consequence. Mr. Langley remarks that the level in the important Bahr el Bagur drain was at no time during the year too high, a satisfactory state of things as compared with previous years.

The closure of drains for clearance always leads to trouble and it is impossible to clear many of the tail portions of the smaller drains satisfactorily by hand even when closed, the sides fall in so rapidly as the bed is lowered. Attention must evidently be turned to the introduction of small dredgers or excavators worked from the banks.

The capital expenditure on drains has been diminishing rapidly during the past few years owing to the sums which had to be provided for the Aswan Reservoir, Zifta Barrage and other major irrigation projects, and during the year under review only amounted to L.E. 38,658. This is a pity, as a great deal remains to be done. As a consequence of the small credit for 1904 dredging in the Bahr el Bagur drain had to be suspended, and dredging is such a slow business at best that it is a pity to keep any available dredgers idle. The most urgent works not already in hand are:

In the 1st Circle.—Remodelling the Bahr Hadus which is the drainage outfall for a large portion of Sharkia and Dakahlia. The estimated cost of this work is L.E. 85,000. Remodelling the Bahr Faqus, Himeri and Nizam Drains.

In Zifta Circle.—Outfalls for the Samatay and No. 3 drain.

The main drains in the 2nd and 3rd Circles have now got fairly ample sections and only require steady maintenance.

A capital expenditure of L.E. 80,000 to L.E. 100,000 per annum for the next few years is required to make the sections of the main drains in the Delta correspond to requirements.

PERCENTAGE OF SALT IN DRAINAGE WATER.

Mr. Langley gives the following interesting statement showing the results of salt tests of drainage water made with the "Electric Bridge Machine" (Western Electric Company New York).

DATE OF TEST	SITE FROM WHICH SAMPLE WAS TAKEN.	Number of parts salt per 100,000.
September 28th...	Bahr Saft Drain, Abi Shekuk	27
" 29th...	" " Tail of Bahr Attil... ..	43
" "	" " 5 kilometres from tail	60
" "	" " at tail	100
" 30th...	Bahr Faqus at San	66
October 1st ...	Bahr Taweed, kilometre 3.500	82
" "	Tail of Bahr Hadous	94
" "	Tail of Masraf Umm El Behera	65
" 2nd ...	Bahr Hadous at Douar Salama	55
" "	Tail of Gabbada drain... ..	38
" "	Tail of Nizam drain	48
" "	Tail of Buhia drain	37
" "	Hennari drain, 6 kilometres from tail	48

The flood discharge of the canals was at its maximum when the observations were made which accounts for the low percentages of salt obtained. The plan on plate I shows the position of the various sites from which samples were taken. It is interesting to note how the percentage of salt increased on the Bahr Saft drain as it advanced into the salt land at its extremity. The percentage fell again below the junction with the Bahr Faqus, which was passing a good deal of flood-water.

MEX PUMPING STATION.

The following statement shows the amount of work done by Mex Pumping station and the cost of working, and compares the figures with previous years.

SEASON.	Quantity pumped c. metre.	COAL.		Total cost of working.	Cost per million. c.m. pumped.
		Tons per million. c.m. pumped.	Price per ton.		
1895-1896	175,078,166	—	—	7,588	43.001
1896-1897	216,994,810	—	—	8,068	37.100
1897-1898	227,429,530	—	—	8,675	38.000
1898-1899	281,896,064	—	1 237	8,378	30.000
1899-1900	202,987,741	—	1 678	9,391	46.261
1900-1901	316,435,869	21.4	1 746	14,182	44.818
1901-1902	381,916,013		1 286	13,297	34.548
1902-1903	396,420,022		1 208	12,591	31.609
1903-1904	310,017,839	19.4	1 159	10,158	32.766

The quantity pumped was the smallest for the last four seasons. The large difference as compared with the two previous seasons is chiefly due to the small rainfall which was only 4.25 ins. while for the previous season it was 11.27 ins., and the average for the eight previous seasons is 10.37 ins. Careful regulation of the canal discharges in flood and winter also helped to keep the lake down.

The cost of pumping was slightly higher than in the previous season, though coal was slightly cheaper. Had the cube pumped been bigger the cost per unit would have been less, as during the pumping season the amount of establishment employed is practically constant. The mean lift was also eight centimetres higher than in the previous season.

Pumping commenced on 26th September 1903 and terminated on 16th March 1904 when the level of the lake was 2.75. Under the influence of the good summer supply the level rose instead of falling during the summer and the pumps had to be started again on 1st September 1904, which is very early. With the shorter supply of 1905 the level will probably fall steadily.

The following statement gives the details of rainfall and the maximum and minimum levels of the lake for the past nine seasons. The maximum level though below that of the years 1895 to 1899 is still high seeing the light rainfall while the minimum level is the highest on record.

SEASON.	Rainfall.	Maximum level of lake.	Date of maximum level.	Minimum level of lake	Date of minimum level.
1895-1896 ...	10.45	-2.15	17th March.	-3.15	22nd August.
1896-1897 ...	8.53	-2.03	7th January.	-2.92	11th Sept.
1897-1898 ...	13.94	-2.17	23rd January.	-3.20	27th August.
1898-1899 ...	11.88	-1.95	13th March.	-3.26	16th Sept.
1899-1900 ...	8.28	-2.29	18th February.	-3.29	14th August.
1900-1901 ...	10.08	-2.18	27th January.	-3.23	17th August.
1901-1902 ...	8.55	-2.31	19th January.	-2.85	16th August.
1902-1903 ...	11.27	-2.41	4th & 25th Jan.	-2.78	4th July.
1903-1904 ...	4.25	-2.18	23rd January.	-2.78	19th March.
			24th December.		

The mean date of minimum level for the eight seasons prior to last season was the 20th August.

Plates 2 and 3 give gauge diagrams for both lakes Mariotis and Edfu. The effects of the small winter rainfall and high summer supply of the past season are very marked in both diagrams.

CHAPTER IV.

NEW WORKS OF IRRIGATION AND DRAINAGE AND WORKS CHARGED TO SUNDRY SPECIAL CREDITS.

The following statements show the Caisse Credits available for expenditure on special works during the year, the actual expenditure incurred and the balances to be carried forward:—

CAISSE CREDITS, 1901.

	Balance from 1902	Original allotment, 1901.	Total	Modified	Personal-Share	Balance to carry forward.
	L.E. M.	L.E. M.	L.E. M.	L.E. M.	L.E. M.	L.E. M.
<i>Irrigation improvements.</i>						
1st Circle...	5,885,114	1,700 —	10,585,114	10,655,557	8,916,678	1,709,089
2nd Circle...	16,095,751	2,000 —	18,095,751	17,776,751	15,795,000	1,981,542
3rd Circle...	6,723,692	10,000 —	16,723,692	16,403,692	15,005,828	1,127,781
Delta Barrage...	528,325	5,000 —	5,828,325	5,888,325	5,888,325	—
Zifta Circle...	—	—	—	11,925 —	6,150,578	5,774,422
Total...	29,233,882	21,700 —	51,233,882	62,769,505	51,816,498	10,993,037
<i>Subsidiary works.</i>						
<i>Zifta Barrage.</i>						
1st Circle...	1,000 —	—	1,000 —	1,000 —	3,597,612	402,388
Zifta Barrage...	817,441	—	817,441	3,817,441	1,899,754	1,917,677
Total...	1,817,441	—	1,817,441	7,817,441	5,497,376	2,320,065
<i>Drainage.</i>						
1st Circle...	7,247,106	10,300 —	17,547,106	17,547,106	14,015,006	3,361,100
2nd Circle...	16,855,892	6,000 —	22,855,892	11,655,892	5,823,077	5,832,725
3rd Circle...	2,268,892	2,000 —	12,68,892	3,568,971	3,751,791	1,817,180
Total...	26,401,770	18,300 —	44,701,770	31,771,882	23,617,877	10,954,005
<i>Totals: Irrigation Improvements, Drainage and Subsidiary Works, Zifta Barrage.</i>						
	56,755,093	40,000 —	100,755,093	150,058,828	80,931,721	21,167,107
<i>Zifta Barrage.</i>						
Zifta Barrage...	15,271,925	—	15,271,925	15,271,925	11,385,734	886,191
1st Circle (spent by)...	5,988,740	—	5,988,740	2,988,740	2,815,293	173,447
Total...	21,260,665	—	21,260,665	18,260,665	14,201,027	1,059,638
Mehallet El Amir Sadik...	1,129,219	10,000 —	11,129,219	10,000 —	3,508,007	1,293
<i>Special Low Nile Credit.</i>						
3rd Circle...	396,432	—	396,432	450,600	450,120	0,180
<i>Special Low Flood Credit.</i>						
1st Circle...	250 —	500 —	750 —	48 —	180,167	4,833
2nd Circle...	177,889	—	177,889	—	—	—
3rd Circle...	551,620	800 —	1,351,620	1,298,952	628,195	969,850
Barrage...	793,579	1,700 —	2,453,579	2,453,579	975,111	1,477,668
Total...	1,723,088	3,000 —	1,723,088	1,298,631	1,781,271	2,452,360
Grand Total...	85,272,497	53,000 —	138,272,497	138,016,721	110,865,146	27,681,578

CAISSE CREDITS, 1901, BY CIRCLES.

	Balance from 1900.	Allocated in 1901.	Total	Months	Expendi- ture.	Balance to carry forward.
	L.E. M.	L.E. M.	L.E. M.	L.E. M.	L.E. M.	L.E. M.
<i>1st Circle.</i>						
Irrigation Improvement :						
Drainage Subsidiary Works						
Zifta Barrage	23,120,990	15,000	38,120,990	31,991,613	29,192,589	5,589,024
Special Low Flood	250	500	750	485	181,167	1,833
Total	23,370,990	15,500	38,870,990	35,176,613	29,882,756	5,593,857
<i>2nd Circle.</i>						
Irrigation Improvements						
Drainage	32,952,553	8,000	10,952,553	29,132,553	21,618,086	7,811,167
Low Flood	177,889	—	177,889	—	—	—
Total	33,130,442	8,000	11,130,442	29,132,553	21,618,086	7,811,167
<i>3rd Circle.</i>						
Irrigation Improvements.						
Drainage	9,022,521	12,000	21,022,521	22,072,636	18,787,672	3,214,964
Rosetta Sudd	1,129,219	10,000	11,129,219	10,000	9,998,007	1,093
Low Nile	386,132	—	386,132	150,990	459,120	0,180
Low Flood	551,620	800	1,351,620	1,298,052	328,193	969,859
Total	11,089,492	22,800	33,899,723	33,781,288	29,573,992	4,217,206
<i>Delta Barrage.</i>						
Irrigation Improvement	828,325	5,000	5,828,325	5,888,325	5,888,325	—
Low Flood	753,579	1,700	2,453,579	2,453,579	975,911	1,177,668
Total	1,581,904	6,700	8,281,904	8,311,904	6,864,236	1,177,668
<i>Zifta Circle.</i>						
Irrigation Improvements	—	—	—	11,925	6,150,578	5,771,122
Total	—	—	—	11,925	6,150,578	5,771,122
Zifta Barrage	15,271,925	—	15,271,925	15,271,925	11,385,731	886,191
Subsidiary works	817,111	—	817,111	3,817,441	4,892,761	1,917,677
Total	16,089,036	—	16,089,036	19,089,366	16,285,198	2,600,868
Grand Total	85,272,497	53,000	138,272,497	138,016,724	110,365,146	27,681,578

The total sum under the head of Caisse Credits available for expenditure during the year was L.E. 138,016 and the actual expenditure incurred was L.E. 110,365 leaving a balance of L.E. 27,681 to be carried forward. As usual nearly the whole of the unexpended balance is due for land taken up. In addition to the above sum of L.E. 110,365 a sum of L.E. 45,967, of which L.E. 36,516 were provided from the

Ordinary Budget and L.E. 9,271 from special credits for Nile banks and an irrigation house at Mansourah furnished by the Ministry of Finance, was spent on special works, raising the total expenditure on the latter to L.E. 156,332. The expenditure was divided between the circles as follows:—

CIRCLE.	Irrigation Improvements.	Drainage works.	Sundry special works.	Total.
	L.E.	L.E.	L.E.	L.E.
1st Circle	19,586	17,020	1,480	38,086
2nd Circle	29,772	4,630	2,421	36,823
3rd Circle	19,412	7,995	15,776	43,213
Zifta Circle	4,012	9,013	850	13,875
Delta Barrage	7,073	—	976	8,049
Zifta Barrage	16,286	—	—	16,286
Total	96,171	38,658	21,503	156,332

IRRIGATION IMPROVEMENTS—1ST CIRCLE.

The following statement gives the list of works carried out in the 1st Circle under the head of irrigation improvements and the expenditure incurred on each:—

NAME OF WORK.	Expenditure.
	L.E.
Extension of Om Galagel Canal	1,410
.. Gazali Canal	2,637
.. Zaglula Canal	2,266
New spurs in Rayyah Tewliki	1,543
Head sluices and pipes on Khalili Canal	1,004
Filling in Gheziret Badran Canal	641
Establishment, Survey maps, &c.	3,972
Revetment in the Mansuria and Om Salama Canals	1,194
Land payments	3,118
Various petty works	1,771
Total	19,586

Of the above sum L.E. 15,360 were charged against Caisse Credits and L.E. 4,226 against Ordinary Budget.

Om Galagil and Ghazali canal extensions.—These were completed last year and the expenditure shown was in settlement of out-standing accounts.

Extension Zaglula canal.—This was an old Nili channel lying between the Mansuria canal and the river, north of the new Mansuria head. A new head above Mit Ghanur regulator was built for it in 1903 in connection with the Zifta Barrage subsidiary works, and syphons were also provided for it under the Om Salama and Mansuria canals. During the year the channel was remodelled and converted into a perennial canal from kilometre 1 to kilometre 11. Three regulators, three head sluices, and four timber bridges were built in connection with the work.

New spurs Rayyah Tewfik.—The expenditure represents payments for the work done during the closure of 1903-1904. Spurs were made on a further length of 5 kilometres during the closure in December 1904 and January 1905. The work has now been carried down to kilometre 33 from the head.

Head sluices and pipes Khalili canal.—The Khalili canal is one of the main canals in Sharkia. During the year 19 kilometres of this canal were completely re-modelled, the work being charged to Ordinary Maintenance. The expenditure of L.E. 1,004 was incurred on four masonry and three pipe sluices for branches.

Filling Gheziret Badran canal.—This was a Nili canal transversing portions of the Shoubra suburb, which it was decided to fill in for sanitary reasons. The work was carried out satisfactorily and cheaply by pumping silt from the river into the channel, as there was no available spoil in the neighbourhood. The floor of the culvert carrying the canal under the Shoubra road was lowered so that the tail portion, which is to be preserved, can be fed from the Boulakia canal.

Revetments Om Salama and Mansuria canals.—These were made in the vicinity of the Mansuria head and Om Salama head close to Mit Ghanur regulator.

Various petty works.—These included pipe sluices for several distributaries, raising the sides of Hamout aqueduct, supply of iron grooves and regulating timbers, a stable at Zagazig, provision of boundary stones and kilometre-posts, and a diversion for the Light Railway on the bank of the Om Salama canal.

IRRIGATION IMPROVEMENTS—2ND CIRCLE

The following were the irrigation improvements in the 2nd Circle.

NAME OF WORKS.	EXPENDITURE.
	L.R.
Manufacture of bricks for new works	1,326
Purchase of regulating timbers, Cast-iron grooves, &c. from Government Arsenal	675
Boundary stones	232
East Nakrashia syphon, Naggur Canal at Achmoun	437
Remodelling Santa regulator	1,082
" West Ghannabyiah Bahr Saidi	1,215
" Telwana Canal	425
" Melig Canal	1,922
" Baguria and Sirsawia head regulators	1,065
Radi Canal	1,940
Nagail Canal	1,296
Salahib Canal	1,193
Remodelling Bassioun and Qoddaba regulators	432
" head regulators of Naggur and Nanaia Canals.	440
Fourteen new head sluices and regulators on distributaries ...	3,882
Petty works	1,811
Buildings	1,110
Purchase of land	6,987
Temporary establishment	1,947
Purchase of topographical maps	225
Total... ..	29,772

East Nakrashia syphon on Naggur canal.—The old pipe syphon, carrying the east Nakrashia Nili canal under the Naggur canal at Achmoun, which was too short and of insufficient section, has been replaced by a longer syphon of larger section.

Santa regulator.—Since the creation of the Rayyah Abbas and the Zifta Circle, this regulator has become very important. It is necessary to regulate the discharge passing through it in summer to a nicety, and its complete closure is often necessary during flood, when Zifta Circle wishes to draw its supply through the Rayyah Abbas. It was impossible to either regulate with precision or to approach a complete closure with the old system of vertical timbers, so the regulator has been remodelled, and provided with gates and a travelling winch. The work was done during the closure of December 1904 and January 1905. The expenditure shown is for purchase of materials.

West Ghannabiyin Bahr Saidi.—This channel takes off on the left bank of the Bahr Saidi just below the Qoddaba syphon. It has been completely remodelled on a length of 7 kilometres and provided with 10 timber bridges and outlets. The new agricultural road between Dessuq and Salahib runs along its left bank.

Telwana and Melig canals.—The remodelling and extension of these canals alluded to in last year's report has now been completed.

Radi and Negail canals.—The remodelling and extension of these flood canals, noted on in last year's report, was continued during the year. The expenditure on the Nagail canal project up to date has been L.E. 25,873 and on the Radi canal L.E. 3,685. The upper reach of the latter between the Barrage and Nanaia remains to be taken in hand.

Bassioun and Qoddaba regulators.—The fitting of the important Bassioun regulator with gates and winch, started in 1903, has been completed. The Qoddaba regulator has been fitted with cast-iron grooves and horizontal timbers to replace the old system of vertical regulation.

Naggur and Nanaia head regulators.—These regulators are also being remodelled and fitted with gates and winches.

Baguria and Sirsauria head regulators.—The remodelling and fitting of these important regulators with gates and winches has now been completed.

Salahib canal.—This is a high level distributary along the left bank of the Bahr Tirah which was commenced last year and has now been completed.

Petty works.—These include sundry small bridges, escapes and numerous outlets. In all there were 28 works or groups of works such as irrigation outlets.

Buildings.—These included an annex to the irrigation office at Shihin El Kom, stables at Bahr Saidi head, and 9 sets of Ghaffirs huts. Much attention in all the circles is being paid to the establishment of a proper system of patrols, which is the first step towards the proper maintenance of channels, and prevention of their wanton destruction. The provision of quarters for the Ghaffirs at suitable central positions such

as the heads of the canals is of great importance. The fact of the existence of the quarters attracts a better class of man and one knows where to find him when he is required.

IRRIGATION IMPROVEMENTS.—3RD CIRCLE.

The following were the irrigation improvements effected in 3rd Circle:—

NAME OF WORK.	EXPENDITURE.
	L.E.
Remodelling Kafr Bulin regulator	4,000
" Abu Diab head regulator	397
Diversion of Khatatbah Canal at Damanhour	4,882
Fazara Canal project	4,242
Regulators for branch canals	2,510
Boundary stones	300
Purchase of land	577
Establishment and Survey	2,534
Total... ..	19,442

Kafr Bulin regulator and Abu Diab head sluice.—The Kafr Bulin regulator is a very antiquated structure and the masonry was in a very dilapidated condition. It was intended to entirely remodel it and provide it with gates. Owing to the group of works at the site which include, besides the regulator itself, the Kafr Bulin escape, the Nubaria canal head, the Abu Diab and Nigheh canal heads; the space available for a diversion is very limited. In an ordinary year the consumption of water in Behera is very limited till March, owing to the considerable rainfall, so the time of low supply is of considerable length. 1904 was unluckily a very dry year, the rainfall of 4.25 ins. being somewhat below half the normal, consequently the contracted diversion channel proved insufficient a month earlier than anticipated, and it was decided that the work was not urgent enough to justify keeping the province short of irrigation during the sowing season. The work was therefore abandoned before completion and must be taken up again. The piers which were full of huge cavities were repaired with cement masonry, and the crumbling arches removed and replaced with girders and jack-arches. The floor appeared fairly sound. The floor of the Abu-Diab head was thoroughly repaired, and the cast-iron grooves erected so that it is now in a position to receive the gates. A second closure will be

required to complete the work which has meanwhile been much strengthened.

Diversion of Khatatbah canal at Damanhour.—This work has long been contemplated. The old channel passed in a very acute bend close under the town. The banks were worn away to knife-edges, and no earth within a reasonable distance was to be had for their repairs. This reach always caused much anxiety during flood. The bend of 1,400 metres in length has now been replaced by a straight channel 600 metres long of 20-metre bed with good banks and berms, well away from the town, making everything quite secure. The work necessitated the removal of the Delta Light Railway station, and bridges over the new channel for the Delta Light Railway and Shibrakhit agricultural road.

Fazara canal projects.—This work consisted in the conversion of the old Fazara Bahr, which runs into lake Edku, into a drain, by the construction of irrigation channels aggregating 1.4 kilometres in length to take up the irrigation from it.

Regulators on branch canals.—Much needed regulators were built on the Sherif, Terakamba, Nafra, Magnuma, Shibrakhit, Dahri and Baslaqun canals.

IRRIGATION IMPROVEMENTS—ZIFTA CIRCLE.

The following were the irrigation improvements effected in Zifta circle.

NAME OF WORK.	EXPENDITURE.
	L.E.
Buildings	566
Pipes for irrigation outlets	1,198
Kilometre posts	110
Boundary stones	308
Construction of Hamul Canal	1,808
Purchase of land	22
Total... ..	4,012

On the above expenditure L.E. 3,929 was charged to the Ordinary Budget and L.E. 83 to Caisse Credit.

Buildings.—These included stables at Mehalla Kebir rest-house and several sets of Ghaffirs huts.

Hamul canal.—This is a high level distributary on the right bank of the Bahr Tinch, below Salahib 5.22 kilometres in length.

IRRIGATION IMPROVEMENTS—DELTA BARRAGE DIRECTORATE.

The following were the irrigation improvements in the above Directorate:—

NAME OF WORK.	EXPENDITURE
	L.E.
Remodelling Khashab Canal	6,359
Establishment and survey	714
Total... ..	7,073

Of the above sum L.E. 5,888 was charged to Caisse Credits and L.E. 1,185 to Ordinary Budget.

Khashab Canal.—This canal was remodelled on a length of 5.26 kilometres, carrying the work down to kilometre 10.64. The bed has been increased from 7 to 10 metres throughout this length and the banks thrown well back. Two head-slucies for branch canals were built, also a bridge, five large pipe-culverts and a number of small ones. The improvement in the flood irrigation of east Gizeh since this canal has been taken in hand has been very marked.

Survey.—A level survey of east Gizeh was made in connection with the proposal for the Sefi irrigation of the latter by means of pumps.

ZIFTA BARRAGE.

The capital expenditure of L.E. 16,286 was incurred as follows:—

	L.E.
Completion of Mansuria head and lock..	5,152
Purchase and rent of land	10,538
Salaries: T. A. and settling final Accts. Zifta Barrage and Rayyah Abbas	596
Total	<u>L.E. 16,286</u>

DRAINAGE WORKS.—1ST CIRCLE.

The following is the detail of the expenditure on drainage works in the 1st Circle.

NAME OF WORK.	EXPENDITURE.
Mit El Amel drain... ..	912
Rain-water syphons Suez Canal	345
Remodelling Mahsama-Timsah drain... ..	5,644
" Bahr Taweel	5,810
" Bahr El Bagar... ..	911
Stone revetment Abu-Zabel syphon	160
Purchase of steam weed-cutter	380
Conversion of the old Saida canal head into a drainage syphon	286
Pipe syphons under Om Nawar and Sayda Canals for Neghir	
drain	106
Purchase of land	2,463
Total... ..	17,020

Of the above expenditure L.E. 14,043 was charged against Caisse Credits and L.E. 2,977 against Ordinary Budget.

The expenditure on Mit El Amel drain and rain-water syphons Suez Canal represent balances due for work done last year.

Mahsama-Timsah drain.—The syphon at Abu Balah under the Suez sweet-water canal was completed and the approach channel to it dug. The widening and deepening of the channel from kilometre 2 to kilometre 8 was completed. The work done up to date has considerably reduced the level of lake Mahsama.

Remodelling Bahr Taweel drain.—The present condition of this drain was described in last year's report. The work of deeping was continued during the year on a length of 2 kilometres which makes the progress up to date $3\frac{1}{2}$ kilometres out of a total of 7 kilometres.

Bahr El Bagar drain.—The expenditure represents payments for work done last year. Funds did not admit of the work being continued during the year. It is hoped to go on with the work in 1905.

Purchase of steam weed-cutter.—This machine only arrived from England late in the year. It has just been tried and seems to promise

well. A really satisfactory machine of this type would be of untold value and do much towards solving the weed-problem in our big drains.

Converting the old Saida Head into a drainage syphon.—This work was described last year. Progress has necessarily been slow but the work so far has been quite successful. On completion of the grouting underneath it, the floor was lowered and found to be quite solid, and the pipe has been placed in the trench cut for it. At the end of the year work was in progress at the up and downstream ends of the pipe. Owing to the prevalence of springs the excavation was carried out by dredgers, and the floor under the ends of the pipe formed by skipping in cement concrete.

It is hoped to complete the job early in the current year. The cost has been only a tithe of what a new syphon at this site would have been.

DRAINAGE WORKS.—2ND CIRCLE.

The following statement gives the expenditure on drainage works in the 2nd Circle.

NAME OF WORK.	EXPENDITURE.
	L.E.
Remodelling Foa and Urban drains	663
Ditto Samalay drain	1,989
Survey	618
Establishment	960
Purchase of land	400
Total... ..	4,630

All the above expenditure was charged to Caisse Credits.

The expenditure on item No. 1 represents the balance due for works done last year. Of item No. 2, L.E. 234 was paid for earthwork done last year. The balance of L.E. 1,795 was spent on three road bridges, including one swing bridge over the junction of the Bahr El Adna, one syphon and some pipe inlets.

There was no remodelling carried out during the year under the head of new works. L.E. 960 does not represent the actual cost of establishment. The temporary establishment on special works is employed indiscriminately either on works of irrigation or drainage, one man may be employed partly on both, so it is difficult to apportion the establishment charges correctly to each sub-head. The total cost of establishment and survey on special works both irrigation and drainage was L.E. 2,907 or $8\frac{1}{2}\%$ of the total expenditure.

DRAINAGE WORKS.—3RD CIRCLE.

The following statement gives the expenditure on drainage works in the 3rd Circle.

NAME OF WORK.	EXPENDITURE.
	L. E.
Remodelling Damanhour drain	2,400
Purchase of land	2,031
Establishment and survey	2,564
Gisir El Insha Drain	1,000
Total... ..	7,995

Of the above expenditure L.E. 3,752 was charged to Caisse Credits and L.E. 4,243 to Ordinary Budget.

Damanhour drain.—The work started last year was continued for a further length of 5 kilometres and will be completed in 1905.

Gisir El Insha drain.—This is a branch of the Fazara Drain 6 kilometres in length.

Establishment.—As in the case of the 2nd Circle the establishment was employed on various works besides those of drainage.

DRAINAGE WORKS.—ZIFTA CIRCLE.

The following statement shows the expenditure on drainage works in the Zifta Circle.

NAME OF WORK.	EXPENDITURE
	L.E.
Remodelling Mohit drain	3,642
Belqas-Kafra Railway drain	493
Remodelling Ibshan drain	1,900
Compensation for crops... ..	71
Temporary establishment	1,680
Purchase of land	1,227
Total... ..	9,013

Of the above expenditure L.E. 6,068 was charged to Caisse Credits and L.E. 2,945 to Ordinary Budget.

Remodelling Mohit drain.—As this drain has figured in annual reports off and on for some years past it appears advisable to note here what is the condition of affairs as regards it at present. The drain is 86 kilometres in length, and it was decided to widen and deepen it last year. Such remodelling has been found necessary sooner or later in the case of all the main drains, especially those first constructed like the Mohit. During the year the banks were thrown back and the channel dredged to full section on a length of $8\frac{1}{2}$ kilometres (from kilometre 17 to 25). Work will be continued on the 17 kilometres between the northern end of last year's work and the sea in 1905. The upper $50\frac{1}{2}$ kilometres of the drain south of kilometre 25 do not require much work, and it can be done by hand.

Belqas-Kafra drain.—This is a branch of the Behut drain running along the Berrari Railway to serve the area immediately south of the latter.

Ibshan drain.—The main Ibshan drain is $18\frac{1}{2}$ kilometres in length. Half of this length was remodelled in 1903 and the balance during 1904.

The east and west branches aggregate 42 kilometres in length of which about 19 require remodelling.

Establishment.—The expenditure of L.E. 1,680 was incurred on the whole of the temporary establishment employed in the Circle.

NEW AND REMODELLED CHANSELS.

The following statements show the lengths of new irrigation channels and drains constructed, and the lengths of irrigation channels and drains remodelled under the head of special works with the cubes of earthwork executed.

IRRIGATION IMPROVEMENTS.

CIRCLE.	New Channels kilometres.	Remodelled Channels kilometres.	EARTHWORK BY HAND.		DREDGING.		Total cost earthwork and dredging.
			Cube.	Cost.	Cube.	Cost.	
			C. M.	L. E.	C. M.	L. E.	
1st... ..	—	10·00	109,623	1,635	—	—	(¹) 5,431
2nd... ..	—	—	—	—	—	—	(²) 1,193
3rd... ..	14·75	—	374,874	7,773	—	—	7,773
Zifta	5·22	—	58,656	949	—	—	949
Delta Barrage	—	5·26	220,785	3,422	—	—	3,422
Totals ...	19·97	15·26	773,938	13,779	—	—	18,768

(¹) L.E. 3,796 was paid for work done in 1903.

(²) L.E. 1,193 " " "

DRAINAGE WORKS.

CIRCLE.	New Channels kilometres.	Remodelled Channels kilometres.	EARTHWORK BY HAND.		DREDGING.		Total Cost earthwork and dredging.
			Cube.	Cost.	Cube.	Cost.	
			C. M.	L. E.	C. M.	L. E.	
1st... ..	1·00	8·00	121,033	3,378	213,564	7,261	(¹) 11,553
2nd... ..	—	—	—	—	—	—	(²) 897
3rd... ..	6·00	12·00	90,224	1,840	—	—	1,840
Zifta	4·00	17·60	291,767	4,645	74,057	2,516	7,161
Totals ...	11·00	37·60	503,024	9,863	287,621	9,777	21,451

(¹) L.E. 944 paid for work done in 1903.

(²) L.E. 897 " " "

EXPENDITURE ON SUNDRY CREDITS.

NAME OF CREDITS.	EXPENDITURE.						HOW SPENT.
	1st	2nd	3rd	Zifta	Delta	Total	
	Circle.	Circle.	Circle.	Circle.	Barrage.		
	L.E.	L.E.	G.L.	L.E.	L.E.	L.E.	
Nile Banks... ..	1,000	2,421	5,000	—	—	8,421	Improvements of river banks and supply of stone.
Special Low Nile.	—	—	450	—	—	450	Working All pumps / materials for Nile protection works.
Special Low Flood	480	—	328	—	976	1,784	Irrigation of river sahels.
Mehallet El Amir sadd	—	—	9,998	—	—	9,998	Construction of saddle.
Inspection house Mansourah ...	—	—	—	850	—	850	
Total... ..	1,480	2,421	15,776	850	976	21,503	

Nile banks. — Early in the year, I represented to the Ministry that diversions of the Nile banks were imperative at certain places, if grave risk were to be avoided in the event of a moderately high flood, and asked for an extra credit. A credit of L.E. 13,000 was finally granted, though rather late to be taken full advantage of. With this credit five diversions on the Rosetta Branch and one on the Damietta Branch, aggregating 5.072 kilometres in length, were made, also a good stone-revetment 2 kilometres in length at Kafr Gahannami on the Damietta Branch. A stock of stone was also ordered for a few of the most dangerous shimias, which will be built into spurs and revetments during 1905. A sum of L.E. 3,192 was due by the 2nd Circle at the end of the year for land taken up for the diversions, so the actual balance available on the credit is L.E. 1,387.

Special Low Flood Credit.—The expenditure in the 1st Circle included a culvert on the Sahel Canal to irrigate the high sahel of Zefeta.

AGRICULTURAL ROADS.

The annual progress statement is given below :—

CIRCLE AND PROVINCE	Existing at end of 1903.	Added during 1904.	Total at end of 1904.	Expenditure 1904.
	Kilom.	Kilom.	Kilom.	L.E.
<i>1st Circle.</i>				
Galiubia	107·00	1·0	108·00	{ 218
Sharkia	290·00	—	290·00	
Dakahlia				
<i>2nd Circle.</i>				
Memfia	276·00	—	276·00	{ 3,474
Gharbia	576·00	17	593·00	
<i>Zifta Circle.</i>				
Gharbia	195·00	—	195·00	{ —
Dakahlia	116·00	—	116·00	
<i>3rd Circle.</i>				
Behera	271·00	—	271·00	
Total... ..	1,831·0	18	1,849·00	3,692

Last year's total on being rechecked has been found to be 47 kilometres in excess.

BRIDGES TO REPLACE FERRIES.

The only expenditure under this head was incurred in the 1st. Circle on the following bridges.

Bridge over Buhia Canal at Toukh el Aklam... ..	L.E. 499
Bridges on Rayyah Tewfiki at Mit Ghamr and at Azazia on the Bahr Moes	401
Total... ..	L.E. 900

EXPENDITURE ON BEHALF OF COMPANIES OR OTHER ADMINISTRATIONS.

The following statement shows the special works executed for and at the expense of companies or other administrations.

CIRCLE	Object for which contribution was made.	Amount contributed
		L.E.
2nd Circle . .	Balance of cost of Mohi Shamarka Canal head sluice and tail escape contributed by the Administration of Domains	26
3rd Circle . .	Maintaining bridges on Mahmudia Canal, contributed by Municipality of Alexandria	265
„ . .	Working Aif Pumps for Kom El Akdar Estate ...	11
„ . .	Drainage syphon under Mahmudia Canal and head-sluice on the same for the Abukir Company	5381
Delta Barrage .	Construction of canal for the Warden Estate Company	1215
	Total	6928

A new drainage syphon is being made for the Abukir Company at Ezbet El Khourchid under the Mahmudia Canal and a head sluice on the same canal. The concession of the Warden Company was alluded to in last year's report.

CHAPTER V.

MAINTENANCE AND REPAIRS

In chapter IV an expenditure of L.E. 167,852 has been accounted for. If to this sum we add L.E. 61,084 spent on Establishment we get an expenditure of L.E. 228,936 which, deducted from the total expenditure of L.E. 480,920, leaves a balance of L.E. 251,984 which represents the expenditure for the year on Maintenance.

The above expenditure was distributed between the circles and directorates as follows :—

CIRCLE.	EXPENDITURE.			
	Regular Budget.	Corps abolition.	Sundry Receipts.	Total.
	L.E.	L.E.	L.E.	L.E.
1st Circle	30,524	31,300	317	62,141
2nd Circle	24,371	29,329	89	53,859
3rd Circle	32,705	26,350	295	59,350
Zifta Circle	20,728	21,300	—	42,028
Delhi Barrage Direct...	16,321	7,650	1,372	25,346
Zifta Barrage	2,773	—	487	3,260
Total	127,425	121,999	2,560	251,984

The following statement shows the distribution of the expenditure on the different sub-heads of work in each circle or directorate.

HEAD OF EXPENDITURE	1st Circle.	2nd Circle.	3rd Circle.	Zifta Circle.	Delhi Barrage.	Zifta Barrage.	Total.
	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.
Flood protective works	1,818	10,517	5,664	8,468	7,046	—	33,514
Repairs of structures and general maintenance ...	5,046	3,871	5,566	2,235	9,110	3,260	29,188
Repairs of roads	662	378	500	272	—	—	1,812
Maintaining and working pumping stations ...	—	—	14,600	—	—	—	14,600
Maintenance of canals and drains.	57,611	39,094	32,920	31,053	9,189	—	172,870
Total	65,140	53,860	59,350	15,028	25,346	3,260	251,984

FLOOD PROTECTIVE WORKS.

The following statement shows how the expenditure was distributed between the various classes of work in each circle.

HEAD OF EXPENDITURE	1st Circle.	2nd Circle.	3rd Circle.	Zifta Circle.	Delta Barrage.	Total.
	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.
Purchase of stone and building	1,484	8,237	4,442	6,297	5,860	26,320
Sundry materials	58	—	440	—	77	575
Earthwork	276	2,280	782	2,171	1,110	6,619
Total	1,818	10,517	5,664	8,468	7,047	33,514

Of the above expenditure L.E. 3,336 was charged to Corvée Abolition, and L.E. 30,178 to Regular Budget as shown in Appendix A.

The detail of the work done is as follows:—

CIRCLE	New spurs.	Spurs repaired.	New revetment	Revetment required.
	No.	No.	L.M.	L.M.
1st Circle	—	32	160	673
2nd Circle	2	46	9,504	2,195
3rd Circle	10	34	1,990	3,280
Zifta Circle	7	23	1,549	1,495
Delta Barrage	3	29	(¹) 4,735	(²) 2,010
Total	22	164	17,939	9,653

(¹) Includes 2,033 linear metres of basin banks.

(²) Includes 531 linear metres of basin banks.

The cube of stone purchased was 75,806 metres cube.

There was also a cube of about 20,000 metres cube in stock purchased in 1903. The cube of earthwork executed was 352,161 metres cube; it included four diversions on the Rosetta Branch.

REPAIRS OF STRUCTURES AND GENERAL MAINTENANCE.

Most of the work executed under this head consisted of petty repairs costing small sums. The most important were as follows:—

<i>In 1st Circle</i>	{	Revetting below regulators	}	L.E.	500
		Remodelling Zawameh and Inshas regulators Shilbini Canal		"	938
<i>In 2nd Circle.</i>	—	Repairs to Zifta and Goreib regulators on the Sahel Canal		"	316
<i>In 3rd Circle</i>	{	Demolition of the old Muntaha	}	"	273
		regulator on Khatatbah Canal		"	533
		Revetting below regulators		"	2,500
<i>In Zifta Circle</i>	{	Repairing Aboukir sea wall	}	"	3,260
		Maintaining and working Zifta Barrage		"	282
<i>In Delta Barrage.</i>	{	Repairing Ezbet El Bourq Reservoir ...	}	"	5,720
		Maintaining and working the Delta Barrages and weirs		"	2,172
		The Barrage Gardens		"	1,200
		Petty repairs and labor, Gizeh Province		"	

The Aboukir sea wall continues to give but little trouble. Experiments are now being made with groynes to induce deposit of shingle in front of the wall and revetment.

The Ezbet El Bourq reservoir gave some anxiety after the flood of 1903. There was a considerable settlement of the west wall causing a crack in the floor parallel to it, and a corresponding one in the crown of the west roof-arch. The crack in the floor was opened out and grouted with cement and the reservoir filled to $\frac{2}{3}$ its full capacity. No movement has occurred since.

The Zifta Barrage gave little trouble and the maintenance budget has proved sufficient. Some holes formed in the downstream pitching to a depth of two metres below foundation level. These were filled with stone in flood and since then a few others have formed. The work requires careful watching but there is nothing unusual in the amount of scour. The proposed downstream weir will of course be a great safeguard. The principal item of expenditure was L.E. 1,258 for rubble stone.

The expenditure on the Delta Barrage was about normal. The weirs continue to give no trouble; there was no scour below them during the year.

REPAIRS OF ROADS.

These repairs call for no special remarks except that the sum spent was rather smaller than usual being under L.E. 1 per kilometre. There was no budget allowance for maintenance of roads except in the 3rd Circle. The 1905 budget allows a fairly liberal provision for road maintenance so it is hoped to gradually get the latter into something like order.

MAINTAINING AND WORKING PUMPING STATIONS.

The expenditure under this head was L.E. 14,600 of which Mex Station accounted for L.E. 14,000 and Atf for L.E. 600. The actual cost of working the Mex pumps was L.E. 10,158 the balance of L.E. 3,842 was spent on fitting up a workshop which was badly needed. The L.E. 600 represents the cost of permanent establishment and maintenance of Atf Station. The cost of pumping has already been shown in Chapter IV under Special Credits.

MAINTENANCE OF CANALS AND DRAINS.

The following statements show the work done and expenditure incurred on the maintenance of canals and drains.

MAINTENANCE OF CANALS.

CIRCLE	EARTHWORK BY HAND		DREDGING		Wood clearance.	Labour and Sundries.	Total Expenditure
	Date.	Expenditure.	Date.	Expenditure.			
	C.M.	L.E.	C.M.	L.E.	L.E.	L.E.	L.E.
1st Circle...	1,656,137	28,197	509,580	17,326	597	3,591	49,711
2nd Circle	2,353,672	31,321	—	—	8	2,536	(*) 36,865
3rd Circle	755,441	16,956	190,588	7,500	600	672	25,728
Zifta Circle...	1,559,557	30,123	27,410	937	—	62	31,122
Delta Barrage	603,715	8,382	9,167	275	—	532	9,189
Total ...	6,928,525	117,979	736,745	26,038	1,205	7,393	152,615

(*) A cube of 282,093 costing L.E. 3,002 was paid for in December 1903.

MAINTENANCE OF DRAINS.

CIRCLE	EARTHWORK BY HAND		DREDGING		Wood clearance.	Labour and Sundries.	Total Expenditure
	Date.	Expenditure.	Date.	Expenditure.			
	C.M.	L.E.	C.M.	L.E.	L.E.	L.E.	L.E.
1st Circle ...	360,252	5,992	—	—	694	217	7,903
2nd Circle ...	108,246	2,185	—	—	44	—	2,229
3rd Circle ...	96,571	1,292	105,882	3,600	2,300	—	7,192
Zifta Circle...	151,635	2,738	—	—	193	—	2,931
Total ...	706,704	13,207	105,882	3,600	3,231	217	20,255

Adding the totals of these two statements we get the total expenditure on maintenance of canals and drains to be L.E. 172,870 as shown in the previous statement of total expenditure on maintenance.

A great deal was done in the way of remodelling canals, or giving them the sections required, cutting off the worst kinks, moving back the banks, so as to leave a proper berm, and making them up to sufficient height and width. In fact many canals are almost re-made over long lengths. Simultaneously with the remodelling of the canal sections the question of outlets is taken up, openings of excessive size being reduced and open cuts suppressed. The lengths of canal so treated under the head of maintenance were:—

In 1st Circle	112,509 kilometres
„ 2nd Circle	304,000 „
„ 3rd Circle	44,000 „
„ Zifta Circle	185,000 „
	<hr/>
	645,509 kilometres
	<hr/>

At the present rate of progress a few years will see nearly all the irrigation channels in good order with good rideable banks and the rate of maintenance per kilometre will begin to fall.

The expenditure on maintenance of drains is just double what it was last year, but is still a good deal less than it should be. The 2nd Circle especially must devote more attention to the matter. Owing to the good summer supply the drains were pretty full throughout the year and it was very difficult to induce contractors to tackle them. Small dredgers or excavators to run on the banks will have to be employed for the clearance of the tail reaches. The question of weed-clearance was taken up by the 1st, 3rd, and Zifta Circles. In Zifta Circle a gang of men on daily labour cleared 187 kilometres of drain at a cost of P.T. 60 per kilometre against the contract rate of P.T. 180. Such gangs require a great deal of supervision but it would pay to provide this when the rate comes so much less than that tendered at by contractors. In the 3rd Circle a contract for weed-clearance of a group of drains was made with one of our most competent contractors, and it worked well on the whole.

A steam weed-cutter has just been received in the 1st Circle which appears to promise well. Such machines would be of incalculable value on our main drains.

Appendix D gives a list showing the lengths of canals and drains. The maintenance rate per kilometre of the former in the Delta works out to L.E. 16 and of the latter to L.E. 6. The maintenance rate per feddan of cultivated area in the Delta for the year was P.T. 5.3.

The following is the 5 years' statement of dredging executed in the maintenance of canals and drains.

CANALS AND DRAINS.	1899-1900	1900-1901	1901-1902	1902-1903	1903-1904
	C. M.	C. M.	C. M.	C. M.	C. M.
<i>1st Circle.</i>					
Ismailia Canal	225,006	190,722	152,006	302,776	162,918
Sharkawy Canal	77,162	82,647	101,668	72,975	16,112
Bassouta Canal	195,060	220,835	216,157	107,205	18,232
Kumhatin Canal	62,504	84,622	70,886	61,305	45,516
Bahr Saghir Canal	70,197	32,115	34,818	—	—
Suez Branch	—	—	29,001	132,181	207,222
Bahr el Ragar	—	—	5,410	—	—
Total	631,228	620,018	639,946	680,045	509,580
<i>2nd Circle.</i>					
Rayyah Menoufia	235,535	112,567	131,176	—	—
Qasid Canal	138,204	—	—	—	—
Bahr Tirub	5,959	—	—	—	—
Qoddaba Lock	5,512	13,363	—	13,705	—
Baguria Head	4,121	2,380	4,014	—	—
Kafr Balsa Lock	—	—	5,966	—	—
Muhit Drain	—	—	—	14,706	27,110
Total	109,631	128,310	141,156	28,411	27,110
<i>3rd Circle.</i>					
Rayyah Behera and Khatatbah Canal	136,516	109,915	82,266	114,837	—
Mahmudia Canal	117,530	159,921	112,027	103,395	100,588
Nubaria Canal	17,813	—	—	—	—
Edku Drain	—	—	—	—	105,882
Total	271,860	309,836	224,293	278,232	296,470
<i>4th Circle.</i>					
Mansura Lock	15,000	21,437	14,621	—	27,410
Total	15,000	21,437	14,621	—	27,410
<i>Delta Barrage</i>					
Lock approaches	—	—	—	—	9,167
Total	—	—	—	—	9,167
Grand Total	1,327,551	1,070,601	1,020,019	986,688	842,627
Expenditure... L.E.	—	—	—	27,574	29,638

The gradual decrease in the dredging of canals is remarkable. Five years ago the cube of dredging executed under the head of maintenance amounted to 1,327,751 metres cube and six years ago to 1,510,438 all of which was in canals. Last year the cube was 842,627 metres cube including the cube of 105,882 metres cube in Edku drain. In other words the dredging done for maintenance of canals has been reduced 50 % the last five years. A certain amount of this reduction is due to the greater command available at the heads of our main canals, since the weirs below the Delta barrages have been built, but it is still remarkable to find the Rayyahs Menufia and Behera, which five years ago accounted for a cube of 400,000 metres, not figuring in the list at all. I may add that the diminution in the cube of clearance done by hand is no less remarkable. A large proportion of the cube figuring in the statement is due to actual widening of channels and making up banks. More careful regulation, reduction of sections by spurring, and the protection of the water-slopes in sand by grass planting, are the chief factors contributing to the reduction of bed clearance. The cube of dredging in the Mahmudia Canal was heavy. A good deal of it was done at Alexandria in the interests of navigation.

CHAPTER VI.

HEWADI TUMILAT ESTATE.

In last year's report the total capital expenditure on developing the Estate was shown as L.E. 45,299. The correct figure is L.E. 45,011, the error being due to the sum representing the difference appearing under the head of Capital expenditure two years running. There has been no capital expenditure during the past year, as the revenue account now shows a considerable surplus and can bear the cost of any further improvements. The original estimate of capital expenditure required was L.E. 62,189 from which sum the actual expenditure incurred falls short by the substantial sum of L.E. 17,178.

REVENUE ACCOUNT.

The following statements show the receipts and expenditure during the year:—

RECEIPTS:—

	L.E.
Rent of land (16,974 feddans... ..)	29,764
.. .. palm trees	350
.. .. water mills... ..	121
.. .. incubator	20
Grazing and sale of wild samar	284
Sundries	116
Total... ..	<u>L.E. 30,655</u>

EXPENDITURE:—

	L.E.
Staff	2,726
Kassassin pumping station	4,056
Taxes	5,906
Payment to Public Instruction	8,000
Maintenance of canals and drains	1,697
Precautions against cattle plague... ..	150
Sundries	197
Total... ..	<u>L.E. 22,732</u>
Surplus	<u>„ 7,923</u>
Total... ..	<u>L.E. 30,655</u>

The receipts fell short of the estimate by L.E. 145, due to remissions of rent on undrained land, a deficit of 26 feddans, as compared with the estimate, in the area actually rented, and a poor date crop.

The expenditure fell short of the estimate by L.E. 25, notwithstanding an unforeseen expenditure of L.E. 406, of which L.E. 256 was due to an accident at the pumping station, and L.E. 150 to expenditure on combatting the cattle-plague.

The increase in expenditure as compared with the previous year was L.E. 936 of which establishment accounted for L.E. 385, and Kassassine pumping station for L.E. 372. The increase in income was L.E. 2,250 all of which was due to increase in rental. The miscellaneous receipts showed a falling off of L.E. 50.

GROWTH OF NET REVENUE.

The following statement shows the growth of the net revenue since the estate was taken in hand in 1899.

												Net Revenue.
												L.E.
1899	...	...	...	...	...	...	...	...	...	...	...	222
1900	...	...	...	...	...	...	...	...	...	...	...	290
1901	...	...	...	...	...	...	...	...	...	...	...	720
1902	...	...	...	...	...	...	...	...	...	...	...	1,593
1903	...	...	...	...	...	...	...	...	...	...	...	6,649
1904	...	...	...	...	...	...	...	...	...	...	...	7,923
Add sale of ploughing engines	...	...	...	...	...	...	...	...	...	...	...	1,267
„ „ of coal to Finance plantation...	...	...	...	...	...	...	...	...	...	...	...	34
												18,698
Deduct purchase of 63½ feddans from Ministry of Finance...												1,117
Balance...												L.E. 17,581

As the estimated surplus on 6 year's working was only L.E. 7,760, the above result is very satisfactory.

Deducting the above surplus of L.E. 17,581 from the total capital expenditure of L.E. 45,010 we obtain a balance of L.E. 27,429 which represents the sum still due to the Ministry of Finance on account of capital advanced. This sum if nothing unforeseen happens should be paid off in the next four years.

The area rented during the year was 16,974 feddans against 16,922 feddans in the previous year. Mr. Laughey considers that the small increase was chiefly due to the cattle plague. Of the 16,974 feddans rented 2,787 feddans were not cultivated.

CROPS.

The areas under the various crops were as follows : —

	Feddans and a. r.
Cotton	4,467
Maize... ..	3,555
Rice	1,562
Sesame	251
Ground nuts	197
Samar	4,080
Vegetables and gardens... ..	75
Total... ..	14,187
Area rented and not cultivated	2,787
Total area rented	<u>16,974</u>

The cotton suffered severely from worm and the yield was about 30% below normal. Samar and maize were both very good crops and the former proved as profitable as cotton.

CATTLE PLAGUE.

The total loss in the Estate since the beginning of the outbreak has been 550 head. Inoculation with serum when practised in time proved very effective. There were no cases of the disease on the Estate at the close of the year.

POPULATION.

Population comes in slowly. On the 16,974 feddans rented there is a population of 14,887 representing about 3,720 labourers or one labourer per 4.57 feddans of rented area.

KASSASSIN PUMPING STATION.

The following statement gives the details of the working of the station for the past four years. The accident to one of the engines and consequent introduction of a temporary pump make the figures for

discharges for 1904 slightly unreliable but they agree very well with those of previous years.

Year.	Area rented.	Quantity pumped.	Quantity pumped per feddan.	CONSUMPTION & COST OF COAL.			Lift	Expenditure for the year.
				Coal consumed.	Cost	Coal per million cub. lifted		
				Tons.	L.E.	Tons.	Metres.	L.E.
1901	12,367	60,660,000	4,917	1,753	3,099	29.0	2.65 to 3.60	3,961
1902	15,200	75,550,000	5,036	2,001	3,240	26.0	2.55 to 3.01	4,234
1903	16,922	89,548,000	5,292	2,099	2,994	23.5	2.45 to 2.77	3,684
1904	16,974	90,622,864	5,340	2,124	3,000	23.4	2.54 to 2.81	4,056

The above results are quite normal. The increase in expenditure was due to special repairs.

The Estate continues to prosper and to be a credit to its administrators Mr. Langley and Moussa Bey Ghaleb.

CONCLUSION.

STAFF.

The new Zifta Circle was formed at the beginning of the year with headquarters at Mansourah. This circle relieves the 1st Circle of about 70 % of Dakahlia or an area of about 355,000 feddans and relieves the 2nd Circle of about 40 % of Gharbia or an area of about 623,000 feddans which makes the total area included in the Circle about 978,000 feddans.

Mr. Ireland was appointed Inspector of the new Circle, and tackled his work with a persistent energy which has borne excellent fruit.

With the ever-increasing amount of detail an inspector has to face, as cultivation spreads and land rises in value, the 1st and 2nd Circles had become impossible charges for one man.

Unhappily the exigencies of the service called away Mr. Ireland to take charge of the important 4th Circle at the beginning of the current year, and Lower Egypt has thus to part with a competent and energetic inspector.

Mr. Dupuis finally left to take up the post of Inspector General of Irrigation in the Soudan at the end of the year. Mr. Dupuis has done an enormous amount of valuable work since he took charge of the 2nd Circle in 1901. He carried on improvements in a thoroughly systematic way on broad lines, with the happiest results, and among other mementoes has left behind him the remodelled system of flood canals in Memfia and hundreds of kilometres of what were extremely ragged and inefficient channels transformed into respectable irrigation canals with good banks, regulators and outlets, reforms which have led to an enormous increase in flow irrigation.

Mr. Molesworth held charge of the 2nd Circle for the greater part of the year, and has proved a very satisfactory inspector.

Mr. F.F. Walsh, a most promising young officer, was also appropriated by the Soudan.

Mr. L.N. Cooper was transferred to Aswan Reservoir, and his services as Director of Works in Zifta Circle could be ill-spared.

In consequence of the above heavy losses the transfers were numerous: Mr. G.J. Brooke, Director of Works was transferred from the 1st Circle to Zifta Circle; Mr. Boxwell, Director of Works from the 1st Circle to the 4th Circle; Mr. E. Lambton, Director of Works, from the 1st Circle to the 2nd Circle; Mr. Morcom, Director of Works, and Mr. O'Sullivan, Surveyor of Contracts, from the 3rd Circle to the 1st Circle; Mr. R. Moser, Director of Works, from the 4th Circle to the 2nd Circle. Messrs. Wallace, Carter and Parker joined the service as surveyors of contracts in November, and have been posted respectively to Zifta Circle, the 1st Circle, and the 3rd Circle.

There were no changes among chief engineers, who generally responded well to the numerous demands made upon them. The amount of work a chief engineer of a province is expected to get through, particularly in the investigation of complicated disputes among cultivators, ever tends to increase.

The names of Mungi Bey, in Gharbia, and Mohamed Bey Shefik, in Sharkia, are often brought to my notice as exceptionally keen and intelligent officers.

K. E. VERSCHOYLE.

Inspector General of Irrigation in Lower Egypt.

APPENDICES

APPENDIX A.

ABSTRACT OF ACCOUNTS, 1904, IRRIGATION DEPARTMENT, LOWER EGYPT.

REGULAR HEAD.	1st Circle.	2nd Circle.	3rd Circle.	Zifta Circle.	Zifta Barrage.	Delta Barrage.	Total.
	L. E. M.	L. E. M.	L. E. M.	L. E. M.	L. E. M.	L. E. M.	L. E. M.
REGULAR BUDGET							
<i>Establishment.</i>							
Classified staff	8,338,189	8,003,957	7,565,112	3,282,713	—	2,917,331	30,107,005
Unclassified staff	3,286,107	3,559,732	2,000, —	2,778,900	983,711	3,621,613	17,101,143
Travelling charges	3,081,299	3,169,669	2,499,904	1,372,143	—	802,103	10,925,121
Telegrams	233,133	173,857	187,995	99,966	—	83,720	778,671
Salaries and rent of offices	528,103	—	200, —	500, —	—	111,677	1,379,680
Office charges and furniture	95,533	285,951	69,221	276,105	—	70,000	797,583
Total	15,563,001	15,101,056	13,423,335	8,909,857	983,711	7,699,780	61,083,803
<i>Works.</i>							
Irrigation improvements	1,226,187	12,784,115	4,406,149	3,928,660	—	1,185, —	10,164,738
Drainage works	2,976,150	—	1,212,951	2,945,337	—	—	26,739,641
Flood protection works	1,818,003	9,875,971	5,119,107	6,295,967	—	7,917, —	39,178,378
Maintenance and repairs of structures and sundry expenditure	1,729,611	3,782,110	5,371,024	2,235,100	2,773, —	7,737,773	26,628,662
Repairs of roads	661,984	377,777	500,000	272,170	—	—	1,811,931
Pumping stations	—	—	11,000, —	—	—	—	14,000, —
Maintenance of canals and drains	23,313,994	10,335,333	7,993,743	11,923,322	—	1,539,118	51,205,940
Total	37,726,632	37,155,366	41,351,571	27,901,786	2,773, —	17,599,122	161,120,530
Total Regular Budget	53,289,636	52,256,532	54,777,906	35,911,643	3,756,711	21,298,972	225,204,113
OTHER CREDITS.							
Coryée abolition	31,900, —	29,399,303	26,359, —	21,900, —	—	7,650, —	121,999,303
Agricultural roads	217,822	3,171,395	—	—	—	—	3,692,217
Bridges to replace ferries	900, —	—	—	—	—	—	900, —
Contribution by other administrations	—	26,361	5,686,756	—	—	1,211,716	6,297,833
Sundry receipts	316,537	88,990	295,279	—	187,220	1,372,282	2,569,308
Special Grants by Finance	1,000, —	2,120,677	5,000, —	850, —	—	—	9,270,677
Total	36,734,359	35,409,816	37,392,035	25,150, —	187,220	10,236,998	145,350,128
SPECIAL GRANTS BY CAISSE FROM GENERAL RESERVE.							
Irrigation improvements	8,916,678	16,988,010	15,035,878	82,895	—	5,888,325	46,911,786
Drainage works	11,013,006	1,690,257	3,551,591	6,967,683	—	—	24,192,740
Special Low Nile Credit	—	—	450,120	—	—	—	450,120
Special Low Flood Credit	180,167	—	328,193	—	—	975,911	1,784,271
Mohallet el Andr Dam	—	—	9,998,007	—	—	—	9,998,007
Zifta Barrage	2,815,293	—	—	—	11,085,734	—	17,201,027
Zifta Barrage subsidiary work	3,597,612	—	—	—	1,899,761	—	5,497,376
Total	29,882,756	21,618,267	29,561,992	6,150,578	16,285,498	6,864,236	110,965,327
Grand Total	119,906,761	109,287,615	121,671,936	67,212,221	20,529,129	42,310,206	480,920,168

APPENDIX B.

LIST OF NEW AND REMODELLED IRRIGATION CHANNELS EXECUTED UNDER THE HEAD OF SPECIAL WORKS.

NAME OF CHANNEL.	New Channels.	Remodelled Channels
	Kilometres.	Kilometres.
<i>1st Circle.</i>		
Zaghlula Canal	—	10·00
Total... ..	—	10·00
<i>2nd Circle.</i>		
	nil	nil
Total... ..	—	—
<i>3rd Circle.</i>		
Fazara Canal and branches	14·00	—
Diversion of Khatatbah Canal at Damauhour	0·75	—
Total... ..	14·75	—
<i>Zifta Circle.</i>		
Hamoni Canal	5·22	—
Total... ..	5·22	—
<i>Delta Barrage.</i>		
Khashab Canal..... ..	—	5·26
Total... ..	—	5·26
Grand Total... ..	19·97	15·26

APPENDIX C.

LIST OF NEW AND REMODELLED DRAINS EXECUTED UNDER THE HEAD OF SPECIAL WORKS.

NAME OF DRAIN	New Channels.	Remodelled Channels.
	Kilometres.	Kilometres.
<i>1st Circle.</i>		
Bahr Tuweel Drain	—	2.00
Mahsana-Timsah	1.00	6.00
Total... ..	1.00	8.00
<i>2nd Circle.</i>		
	—	—
Total... ..	—	—
<i>3rd Circle.</i>		
Damanhour Drain... ..	—	5.00
Fazara Drain	—	7.00
Gisr el Insha, Branch of Fazara Drain ..	6	—
Total... ..	6	12.00
<i>Zifta Circle.</i>		
Mohit Drain... ..	—	8.500
Belqas-Kufra Drain	3.500	—
Elshan Drain	0.500	9.100
Total... ..	4.000	17.600
Grand Total... ..	11.000	37.600

APPENDIX D.

LENGTHS OF CANALS AND DRAINS IN LOWER EGYPT.

CANALS.

CIRCLE.	Bed-width at head above 12 metres.		Bed-width at head between 6 m. and 12 m.		Bed-width at head below 6 m.		Total length kilometres.
	Sett.	Nil.	Sett.	Nil.	Sett.	Nil.	
1st Circle... ..	360	—	313	—	1,935	663	3,271
2nd Circle	482	—	520	—	990	933	2,865
3rd Circle	258	—	325	—	614	45	1,212
Zifta Circle*	196	—	316	—	1,210	58	1,810
Gizeh	—	—	—	170	9	173	352
Totals... ..	1,296	—	1,504	170	4,698	1,872	9,540

DRAINS.

CIRCLE.	Bed-width at tail above 8 m.	Bed-width at tail between 4 m. and 8 m.	Bed-width at tail below 4 m.	Total length kilometres.
1st Circle... ..	319	165	476	960
2nd Circle	151	78	235	464
3rd Circle	147	148	327	622
Zifta Circle	290	248	799	1,337
Gizeh	—	—	4	4
Totals... ..	907	639	1,841	3,387

APPENDIX F

STATEMENT SHOWING THE AREA UNDER DIFFERENT CROPS IN THE PROVINCES, LOWER
AND DOMAINS, FROM THE COMMENCEMENT

NAME OF PLANTING	WINTER CROPS.										SUMMER CROPS.										Vegetables and others.	
	Caulatoes		Wheat.		Rye.		Barley		Other Crops.		Summer Rice		Summer Maize		Cotton		Sugar Cane		Other Crops			
Kalundong	13.5	19	14.74	24	11.24	11	7.40	11	10.97	1	—	—	0	—	14.01	17	101	—	13.04	17	—	—
San Juan	13.74	7	110.99	10	11.92	10	10.50	—	100.20	2	11.10	7	10.10	1	100.21	15	141	0	17.11	11	—	—
Lakhalob	11.11	2	100.00	2	1.00	2	12.12	2	1.12	4	12.11	4	10.10	0	22.10	4	100	22	1.00	12	—	—
Chazbun	11.11	14	100.11	11	11.11	—	11.11	11	100.11	11	10.10	11	1.11	11	100.11	4	11	11	1.11	11	11	11
Yumbun	11.11	11	11.11	11	11.11	11	11.11	11	11.11	11	—	11	11	11	11.11	11	11	11	11.11	11	11	11
Rebun	11.11	—	11.11	11	11.11	11	11.11	11	11.11	11	11.11	11	11.11	11	11.11	11	11	11	11.11	11	—	—
Gish	11.11	11	11.11	11	11.11	11	11.11	11	11.11	11	—	—	11.11	11	11.11	11	11	11	11.11	11	—	—
W. of Cleland	11	11	—	—	—	—	—	—	—	11	—	—	—	—	—	—	—	—	—	11	—	—
.. of Leming	11	11	11	11	—	—	11	11	11	11	—	—	11	11	—	—	—	—	—	11	—	—
.. of Leming	11	11	11	11	11	11	11	11	11	11	—	—	11	11	—	—	—	—	—	11	—	—
.. of Leming	11	11	11	11	11	11	11	11	11	11	—	—	11	11	—	—	—	—	—	11	—	—
.. of Leming	11	11	11	11	11	11	11	11	11	11	—	—	11	11	—	—	—	—	—	11	—	—
TOTAL	11.11	11	111.11	11	111.11	11	111.11	11	111.11	11	11.11	11	11.11	11	111.11	11	11.11	11	111.11	11	11	11

AREAS ACTUALLY CULTIVATED.

Lower Egypt Provinces
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F

EGYPT, INCLUDING GOVERNMENT AND WAKE'S LAND, AND LAND OF THE DAIRA SANJH
OF THE FLOOD OF 1903 TO THAT OF 1904.

[illegible]

RECAPITULATION

	Lower Egypt. Provinces.		Cush.		Governorates.		Total.	
	£.	K.	£.	K.	£.	K.	£.	K.
Winter Crops	2,013,931	5	112,050	8	3,943	12	2,160,517	2
Summer Crops	1,135,940	23	16,181	13	2,672	3	1,185,994	13
Nil Crops	1,190,426	—	38,658	10	855	13	1,229,940	—
Total...	4,340,300	1	227,790	10	7,461	4	4,875,551	2

REPORT ON THE TANZIM DEPARTMENT.

1904

BY

A. H. PERRY.

REPORT ON THE TANZIM DEPARTMENT, 1904.

Cairo, 8th April, 1905.

TO THE ADVISER,
PUBLIC WORKS DEPARTMENT.

SIR,

I have the honour to submit my Report on the operations of the Tanzim Department during the year 1904.

I would bring the following officers to your favourable notice:—

Chief Inspectors.—Messrs. Hewat and Clifton.

Inspectors.—Messrs. Richmond, Chapman, Pastour, Ehrlich,
Schauffele and Reboul.

Electrical Service.—Mr. Fierz.

Waterworks, Nurseries. { Mr. Curtis.
West Roads Circle. }

Gas, Cart Service, Stores.—Mr. Fitz-Patrick.

Accounts.—Yussef Eff. Habib.

The total expenditure on buildings during 1904 was as under :

	L. E.	M.
New works completed or in course of construction	L. E. 138,240	400
Repairs, including Normal Budget, extra grants and funds supplied by various Ministries	L. E. 44,874	—
Vide distribution by Inspections on list attached.		

As shown in my 1903 report the annual credit required for repairs is about L.E. 156,000. As new buildings are substituted for old ones this estimate will diminish in the ratio of 1 to 6.

In view of the fact that complaints are frequently made against the Tanzim for not putting into contravention owners of houses who encroach on the public road, or whose structures threaten to collapse, the attached statement is of interest.

In 15 towns of Lower Egypt alone 1,218 contraventions were made out in Court.

The Port Said Court specially distinguished itself by non-suiting Government in 250 cases, that is in every single case brought up (column I).

Number of contraventions made by Public Works Department and percentage lost in Court.

Towns	Occupation Public Road		Encroaching on Alignment		Demolition Dangerous Structures	
	Number	Lost	Number	Lost	Number	Lost
Port Said...	250	250	20	12	—	—
Zagazig ...	93	10	5	2	—	—
Suez...	57	35	—	—	—	—
Damietta...	36	—	22	9	—	—
Mit-Ghaur ...	10	2	8	2	—	—
Mansourah ...	—	—	66	21	—	—
Matariah...	—	—	5	1	—	—
Tonah ...	103	3	40	8	52	17
Kafr-El-Zaynt ...	7	0	2	—	6	0
Mehallet Kulra ..	13	2	70	8	249	13
Samanoud ...	—	—	8	3	46	5
Talkha ...	—	—	1	—	6	2
Zifiah ...	8	4	1	—	10	0
Chebin-El-Kom ..	5	—	5	1	—	—
Menouf ...	2	—	3	—	—	—
Damanhour ...	8	3	29	2	22	3
Rosetta ...	—	—	4	—	5	0
	592	309	298	69	396	40

	Amount of New Works	Amount of Repairs
	L. E.	L. E.
Hewat...	59,960	4,947
Richmond ...	15,131	—
Chapman ...	10,164	7,889
Clifton ...	46,185	—
Ehrlich ...	4,700	12,033
Schanffele ...	2,100	20,005
	138,240	44,874

A. H. PERRY,
Director General of Towns and State Buildings.

APPENDIX

GENERAL STATEMENT OF NEW BUILDINGS

EXPENDED

WITHIN A PERIOD OF 9 YEARS COMPRISED BETWEEN 1896-1904.

	1903		1904		TOTAL	
	L. E.	M.	L. E.	M.	L. E.	M.
LARGE BUILDINGS.						
Museum of Egyptian Antiquities (Construction and Sundries) ...	256,521	—	—	—	256,521	—
Arab Museum and Khedivial Library (Price of land and furniture not included)... ..	51,300	—	8,000	—	59,300	—
Native Court of Appeal Governorate and Mixed Prison. (Price of land and furniture not included) ...	92,000	—	—	—	92,000	—
Total ...	399,821	—	8,000	—	407,821	—
SCHOOLS.						
Assuan	2,515	—	—	—	2,515	—
Assiut (Model Workshop)	—	—	8,000	—	8,000	—
Cairo (")	14,250	—	—	—	14,250	—
.. (Nasrîeh School)	29,958	—	2,610	—	32,568	—
.. (Abbas School)	7,256	—	—	—	7,256	—
.. (School of Girls) Teachers' house	789	—	3,211	—	4,000	—
.. (Sanieh School)	—	—	19,125	—	19,125	—
.. (Polytechnic School)	—	—	33,000	—	33,000	—
.. (School of Law)	—	—	12,225	—	12,225	—
.. (") mobilier	—	—	2,000	—	2,000	—
.. Medecine School	—	—	1,935	—	1,935	—
Chibin-el-Kom	8,000	—	—	—	8,000	—
Damietta	1,108	—	—	—	1,108	—
Damanhour	776	—	—	—	776	—
Esneh	5,826	—	—	—	5,826	—
Fayoum	—	—	6,000	—	6,000	—
Gnizeh (Agricultural School)... ..	21,450	—	2,500	—	23,950	—
Minieh	4,293	—	—	—	4,293	—
Port Said	4,300	—	850	—	5,150	—
Total ...	100,521	—	91,456	—	191,977	—

GENERAL STATEMENT OF NEW BUILDINGS EXECUTED WITHIN A PERIOD
OF 9 YEARS COMPRISED BETWEEN 1896-1904 (*continued*).

TRIBUNALS.	1903		1904		TOTAL	
	L. E.	M.	L. E.	M.	L. E.	M.
Ayat and Port Said... ..	7,000	—	—	—	7,000	—
Alexandria (Minet-el-Bassal)... ..	—	—	4,700	—	4,700	—
Assuan	—	—	4,660	—	4,660	—
Benha	—	—	4,400	—	4,400	—
Cairo (Tribunal Mixte)	—	—	9,500	—	9,500	—
Chibin-el-Kom	3,335	—	—	—	3,335	—
Dessouk	1,481	—	—	—	1,481	—
Helia (Mehkémé Charieh)	462	—	—	—	462	—
Fayoum	—	—	4,166	—	4,166	—
Luxor	—	—	3,325	—	3,325	—
Minieh and Mehalla... ..	3,630	—	—	—	3,630	—
Mansura	—	—	3,500	—	3,500	—
Sedfa	1,387	—	—	—	1,387	—
Sohag	2,442	—	—	—	2,442	—
Total ...	19,737	—	31,251	—	50,988	—
HOSPITALS.						
	L. E.	M.	L. E.	M.	L. E.	M.
Lunatic Asylum, Cairo	15,500	—	—	—	15,500	—
Alexandria (infectious diseases)	5,000	—	—	—	5,000	—
Assint	10,908	—	—	—	10,908	—
Benha	1,854	—	—	—	1,854	—
Beni Souef, Dammanhour and Fayoum, Cairo (enlargement Kasr-el-Aïni hospital)... ..	12,000	—	—	—	12,000	—
Cairo Bacteriological Laboratory, at the Hospital of Kasr-el-Aïni... ..	25,350	—	—	—	25,350	—
Cairo (local vaccin, Abbassieh)	978	—	—	—	978	—
Chibin-el-Kom	424	—	—	—	424	—
Minia	5,079	—	—	—	5,079	—
Minia	7,500	—	—	—	7,500	—
Mansourah... ..	1,249	—	—	—	1,249	—
Port Said	7,500	—	—	—	7,500	—
Sohag	4,000	—	—	—	4,000	—
Suez	8,000	—	—	—	8,000	—
Tanta	4,050	—	—	—	4,050	—
Works executed by Sanitary Service in 1903	9,000	—	—	—	9,000	—
Works executed by Sanitary Service in 1904	—	—	Mémoire	—	Mémoire	—
Total...	118,392	—	—	—	118,392	—

GENERAL STATEMENT OF NEW BUILDINGS EXECUTED WITHIN A PERIOD
OF 9 YEARS COMPRISED BETWEEN 1896-1904 (*continued*).

DISINFECTION STATIONS.						1903		1904		TOTAL	
						L. E.	M.	L. E.	M.	L. E.	M.
Damietta ... ..	}	...	...	...	...	3,145	—	—	—	3,145	—
Mansourah ... ..		...	...	...	...	
Zagazig ... ..		...	...	...	...	
Tanta ... ..		...	...	...	...	
Suez ... ..		...	...	...	...	
Total...						3,145	—	—	—	3,145	—
SLAUGHTERHOUSES.											
Beni-Souef ... ..		...	...	...	...	1,754	—	—	—	1,754	—
Bonha ... ..		...	...	...	...	582	—	—	—	582	—
Bela ... ..		...	...	...	...	485	—	—	—	485	—
Cairo ... ..		...	...	...	...	6,334	—	—	—	6,334	—
Chibin-el-Kom ... ..		...	...	...	...	513	—	—	—	513	—
Damanhour ... ..		...	...	...	...	1,832	—	—	—	1,832	—
Damietta ... ..		...	...	...	...	841	—	—	—	841	—
Fayum ... ..		...	...	...	...	2,003	—	—	—	2,003	—
Gnizeh ... ..		...	...	...	...	202	—	—	—	202	—
Guirguet ... ..		...	...	...	...	564	—	—	—	564	—
Helwan ... ..		...	...	...	...	716	—	—	—	716	—
Kallinb ... ..		...	...	...	...	534	—	—	—	534	—
Kena ... ..		...	...	...	...	838	—	—	—	838	—
Kafr-el-Zayat ... ..		...	...	...	...	559	—	—	—	559	—
Luxor ... ..		...	...	...	...	569	—	—	—	569	—
Mit-Ghamr ... ..		...	...	...	...	642	—	—	—	642	—
Menouf ... ..		...	...	...	...	684	—	—	—	684	—
Minieh ... ..		...	...	...	...	1,635	—	—	—	1,635	—
Magagah ... ..		...	...	...	...	346	—	—	—	346	—
Mehalla ... ..		...	...	...	...	788	—	—	—	788	—
Mellaoni ... ..		...	...	...	...	521	—	—	—	521	—
Manfalout ... ..		...	...	...	...	835	—	—	—	835	—
Port Said ... ..		...	...	...	...	1,904	—	—	—	1,904	—
Suez ... ..		...	...	...	...	1,100	—	—	—	1,100	—
Sohag ... ..		...	...	...	...	673	—	—	—	673	—
Senoures ... ..		...	...	...	...	405	—	—	—	405	—
Tahta ... ..		...	...	...	...	831	—	—	—	831	—
Zifta ... ..		...	...	...	...	600	—	—	—	600	—
Reserve ... ..		...	...	...	...	5,469	—	—	—	5,469	—
Work executed on Sanitary Service 1901-1904						15,000	—	5,000	—	20,000	—
Total...						49,759	—	5,000	—	54,759	—
GOVERNORATES, MUDIRIYHS AND MARKAZ.											
Assiut (Mondirich) ... ..		...	...	...	...	—	—	10,000	—	10,000	—
Fayum (annex to Mondirich) ... ..		...	...	...	...	494	—	—	—	494	—
Carried forward ...						494	—	10,000	—	10,494	—

GENERAL STATEMENT OF NEW BUILDINGS EXECUTED WITHIN A PERIOD
OF 9 YEARS COMPRISED BETWEEN 1896-1904 (*continued*).

	1903		1904		TOTAL	
	L. E.	M.	L. E.	M.	L. E.	M.
<i>Brought forward</i> ...	491	—	10,000	—	10,491	—
Galioubieh (Mudirs' house) ...	1,627	—	—	—	1,627	—
Keneh (Mudirieh) ...	1,000	—	—	—	1,000	—
Port-Saïd (Governorite)...	18,000	—	201	—	18,201	—
Zagazig (Moudirieh) ...	—	—	22,000	—	22,000	—
Alexandria.-Police Barracks, Quay...	1,783	—	—	—	1,783	—
" Moharrem Bey Caracol...	758	—	—	—	758	—
" Fleming Caracol...	2,695	—	—	—	2,695	—
Att. Police Station ...	710	—	—	—	710	—
Abnub-Markaz ...	1,822	—	—	—	1,822	—
Aboujerkas ...	1,698	—	—	—	1,698	—
Achnoun ...	1,731	—	—	—	1,731	—
Bahia... ..	781	—	—	—	781	—
Badari... ..	1,689	—	—	—	1,689	—
Beba	2,034	—	—	—	2,034	—
Belbeis	3,572	—	—	—	3,572	—
Beni-Souef... ..	6,500	—	—	—	6,500	—
Cairo-Caracol Darb El Ahmar ...	3,000	—	—	—	3,000	—
" " Pyramids ...	1,343	—	—	—	1,343	—
" " Sayeda Zenab ...	617	—	—	—	617	—
" " El Wayli ...	656	—	—	—	656	—
Boulac Police Store... ..	—	—	560	—	560	—
Chonbrakhit Markaz ...	1,651	—	—	—	1,651	—
Dessuk	1,894	—	—	—	1,894	—
Deirut... ..	2,329	—	—	—	2,329	—
Delingat	1,986	—	—	—	1,986	—
Esa	3,704	—	500	—	4,204	—
Etsa	1,701	—	—	—	1,701	—
Facons	1,130	—	—	—	1,130	—
Guirga	1,080	—	—	—	1,080	—
Guizeh	2,881	—	—	—	2,881	—
Kolosna	1,807	—	—	—	1,807	—
Konesna	1,645	—	—	—	1,645	—
Kalliub	1,714	—	—	—	1,714	—
Kom-Hamada	2,816	—	500	—	3,316	—
Maufalut	1,682	—	—	—	1,682	—
Minia	2,478	—	—	—	2,478	—
Nawa	3,347	—	500	—	3,847	—
Port Said: Caracol and post police wall	—	—	3,314	—	3,314	—
Sembellawein	1,751	—	—	—	1,751	—
Sennoures Markaz	1,601	—	—	—	1,601	—
Tahia	1,748	—	1,352	—	3,100	—
Tanna	—	—	3,800	—	3,800	—
Toukh	1,561	—	—	—	1,561	—
Zefu	1,618	—	—	—	1,618	—
Total...	94,706	—	42,731	—	137,436	—

GENERAL STATEMENT OF NEW BUILDINGS EXECUTED WITHIN A PERIOD
OF 9 YEARS COMPRISED BETWEEN 1896-1904 (*continued*).

	1903		1904		TOTAL	
	L. E.	M.	L. E.	M.	L. E.	M.
PRISONS.						
Alexandria	24,245	—	—	—	24,245	—
Abouzalal	475	—	—	—	475	—
Beni-Sonef	25,843	560	—	—	25,843	560
Cairo	43,061	440	—	—	43,061	440
Tanta	35,452	—	—	—	35,452	—
Touza	2,000	—	—	—	2,000	—
Zaguzig	11,385	—	—	—	11,385	—
Works executed by Prisons in 1903	20,000	—	—	—	20,000	—
" " " 1904	—	—	Mémoire	—	Mémoire	—
Total...	162,462	—	Mémoire	—	162,462	—
CUSTOM-HOUSES AND COAST-GUARDS						
Alexandria—Tobacco Stores	37,223	—	—	—	37,223	—
" Sundry Custom-Houses and Coast-Guards... ..	38,274	—	—	—	38,274	—
Damietta—Custom-House	4,878	—	—	—	4,878	—
Ismailia—Custom-House	780	—	—	—	780	—
Port-Elbrahim—Custom-House	923	—	—	—	923	—
Port Said and Kantara	1,865	—	—	—	1,865	—
Port Said petroleum Stores	2,530	—	—	—	2,530	—
Port Said Coast-Guard Barracks	4,339	—	—	—	4,339	—
Suez—Custom-House	3,134	—	—	—	3,134	—
Works executed by Custom-Houses in 1903	7,500	—	—	—	7,500	—
Works executed by Custom-Houses in 1904	—	—	Mémoire	—	Mémoire	—
Total...	101,446	—	Mémoire	—	101,446	—
QUARANTINE STATIONS.						
Alexandria—Mex	9,118	—	—	—	9,118	—
Gabal El Tor	41,721	—	—	—	41,721	—
Port-Tewfik	874	—	—	—	874	—
Total...	51,713	—	—	—	51,713	—
POST OFFICE.						
Alexandria—Annex	665	—	—	—	665	—
Abou-Kébir—Annex	388	—	—	—	388	—
Assint	—	—	800	—	800	—
Assuan	—	—	4,400	—	4,400	—
Beni Muzar and Fichu	—	—	1,200	—	1,200	—
Cairo—enlargement... ..	14,509	—	—	—	14,509	—
Elcheway	457	—	—	—	457	—
Mansourah... ..	773	—	—	—	773	—
Port Said	24,552	—	—	—	24,552	—
Total...	41,344	—	6,400	—	47,744	—

GENERAL STATEMENT OF NEW BUILDINGS EXECUTED WITHIN A PERIOD
OF 9 YEARS COMPRISED BETWEEN 1896-1904 (*continued*).

	1903		1904		TOTAL	
	L. E.	M.	L. E.	M.	L. E.	M.
TANZIM OFFICE.						
Damanhour	1,227	—	—	—	1,227	—
Tanta	1,902	—	198	—	2,100	—
Sohag	3,396	—	—	—	3,396	—
Fayum	—	—	6,104	—	6,104	—
Zagazig	—	—		—		—
Total...	6,525	—	6,302	—	12,827	—
SUNDRIES.						
Annex Ministry of Justice, Sundries p.c.	874	—	—	—	874	—
Annex Sanitary Service	1,497	—	—	—	1,497	—
„ Caisse de la Dette	2,100	—	—	—	2,100	—
Survey Department—Guizeh... ..	1,057	—	—	—	1,057	—
School of Agriculture (dairy and stables)	2,500	—	—	—	2,500	—
Zoological Gardens, Guizeh (2 pavilions)	1,500	—	—	—	1,500	—
Zoological Gardens, Guizeh (pavilion for large animals)... ..	1,898	—	—	—	1,898	—
Zoological Gardens, Guizeh (cage for animals)	4,000	—	—	—	4,000	—
Local for reproduction of plants ...	2,655	—	—	—	2,655	—
Port Said Lazaret	3,000	—	—	—	3,000	—
Local Photographies	581	—	—	—	581	—
House for Director of School of Medicine	2,340	—	—	—	2,340	—
House for Director of Zoological Gardens	713	—	—	—	713	—
Museum of Society of Geography... ..	951	—	—	—	951	—
New Geological Museum	4,602	—	—	—	4,602	—
Firemen's Central Station Cairo ...	18,775	—	10,100	—	28,775	—
New stables, Cairo	6,000	—	—	—	6,000	—
Port Said—Fire hydrants	—	—	2,900	—	2,900	—
Port Tewfik—Sailors lodgings, Ports and lighthouses	—	—	1,500	—	1,500	—
Cairo—Helmyeh ground for foot-ball	—	—	1,750	—	1,750	—
„ M. Colombo's House at Ghezira	—	—	650	—	650	—
„ —Military hospital at Abbassia	—	—	10,000	—	10,000	—
„ Citadel Archives... ..	—	—	2,100	—	2,100	—
„ Khedivial library at Dar-el-Gamameeze	—	—	550	—	550	—
Helouan—Khedivial observatory ...	—	—	6,000	—	6,000	—
Total...	54,943	—	35,550	—	115,943	—

GENERAL STATEMENT OF NEW BUILDINGS EXECUTED WITHIN A PERIOD
OF 9 YEARS COMPRISED BETWEEN 1896-1904 (*continued*).

RECAPITULATION.	1903		1904		TOTAL	
	L. R.	M.	L. R.	M.	L. R.	M.
Large buildings, Museums and						
Courts of Justice	399,824	—	8,000	—	407,824	—
Schools	100,521	—	91,456	—	191,977	—
Tribunals	49,737	—	34,254	—	83,991	—
Hospitals	118,392	—	—	—	118,392	—
Disinfection Stations	3,145	—	—	—	3,145	—
Slaughterhouses	49,759	—	5,000	—	54,759	—
Governorates, Mudirichs and Markaz	94,706	—	42,730	—	137,436	—
Prisons	162,462	—	—	—	162,462	—
Custom-Houses and Coast-Guards..	101,446	—	—	—	101,446	—
Quarantine Stations... ..	51,713	—	—	—	51,713	—
Post-Offices	41,344	—	6,400	—	47,744	—
Tauzim Offices	6,525	—	6,302	—	12,827	—
Sundries	54,943	—	35,550	—	90,493	—
Grand Total ...	1,204,514	—	229,689	—	1,434,203	—

REPORT OF THE TOWNS AND STATE BUILDING SERVICE FOR 1904.

GENERAL.

SPECIAL WORKS—LOWER-EGYPT

LIST A.

Works taken over finally.

Among the works taken over definitely during 1904, the Cairo Law School and Port Said Post Office are the most noteworthy. No repairs of any importance were required to any of these buildings.

The estimates amounted to L.E. 89,365

The expenditure was... .. „ 80,794

This shows an economy of about 10% on the estimates.

LIST B.

During the year, eight buildings have been completed and handed over to the Ministries requiring them.

The estimates amounted to L.E. 90,770

The expenditure, including the 10 % maintenance guarantee was... .. „ 80,695

showing an economy of... .. „ 10,075
or about 11 $\frac{1}{10}$ %.

Sanieh Girls' School.—This building was finished last October, 4 months after the expiration of the contract. The delay was due to the number of changes effected during the work at the request of the Public Instruction.

The School is fitted with electric light throughout; there are 6 fire hydrants as well as the ordinary hot and cold water supply.

Accommodation is provided for 100 in-boarders and 200 day pupils.

Since the School was handed over, the Ministry of Public Instruction asked for a screen wall along the East boundary to prevent the grounds from being overlooked by the neighbouring houses on this side. A wall 90 metres long and 16 metres high would be required. The cost would be over L.E. 2,000.

Even if this wall were built, there are other houses on the other boundaries which overlook the playground; it would seem, therefore, that this expenditure is uncalled for.

No final decision has been arrived at.

Cairo Central Fire Brigade Station and Police Barracks.—The description of this building, which appears to give every satisfaction, was given fully in the last year's report.

The up-to-date appliances for turning out the engine have enabled the fire brigade to compete on favourable terms with the best practice in Europe.

Being a central building a large clock has been installed in the tower. This is connected electrically with 4 other dials placed in the more important offices.

Cairo Mixed Tribunal's Additions.—The additions to the Mixed Tribunal consist of 2 pavilions, one for a Summary law Court, the other for archives and registration offices. A first floor was also built on the present Mortgage Office to accommodate an increased staff.

Electric light is installed throughout.

Book-Cases and Exhibition Cases.—The Book-Cases and Exhibition Cases for the Khedivial Library were completed by the contract date, and have given satisfaction. They are very well constructed and are practically dust proof.

LIST C.

Egyptian Army Hospital, Abbassieh.—This Hospital will contain 228 beds in the main block, 20 beds in a special isolation block, and 12 in the prisoners' ward or, in all, accommodation for 260 patients.

In addition to the usual outbuildings there is a barrack block for 100 men, and large stores for the Egyptian Army Medical Corps.

An important innovation in the building is the abandonment of plaster for outside walls. This not only gives a considerable economy but is, I think, a distinct improvement from an aesthetic point of view. The rubble masonry has brick dressings, cornices and courses of bricks at intervals, and in combination with the wooden verandahs roofed with Marseilles tiles, should compare favourably with the more costly and less durable plaster work with which buildings are usually covered.

The site is at Abbassieh about half a kilometre north of the Egyptian Cavalry lines.

The estimate for the buildings was as follows:—

A— <i>Works put up to adjudication.</i> —Masonry, plastering, joiners, work and sanitary work	L.E.	M.
	14,243	900
B— <i>Works reserved for separate adjudication.</i> — Béton armé floors, roofs and verandahs, paving, roofing, water supply, painting and inside fittings and 2 hand lifts ...	10,696	600
Unforeseen, supervision, Architects, charge	4,429	500
Total ...	29,370	000

As the credit amounted to only L.E. 24,000, it seemed probable that the project would have to be cut down. However, on putting the work under heading A up to the adjudication, the lowest offer received (from M. Trehaki) came to only L.E. 10,717,232 mil., and by slightly reducing the sum allowed for contingencies, we were able to undertake all the work originally projected.—Thus,

A—Works included in Mr. Trehaki's contract	L.E.	M.		
	10,717	232		
Surveillance, Imprévus, etc., 17.1 %	1,832	768	L.E.	M.
			12,500	000
B— Works reserved for separate adjudication	L.E.	M.		
	10,696	600		
Imprévus 7%	753	400		
			11,450	000
Total			L.E.	24,000 000

It may appear remarkable that a contractor should undertake for L.E. 10,717 work valued by us at L.E. 14,244; but, in justification of our estimate, I would point out that of the 9 other tenders received, 5 were above our estimate, while the average of the 9 was within L.E. 250 of it.

The contract was signed on the 1st of June, 1904, and work was begun soon afterwards. Little progress, however, was made during the first 5 months owing to the difficulty of getting material to the site. The Railway Administration was as usual unable to supply trucks, while the cost of road transport was prohibitive. In consequence, no regular supply of stone was furnished till the middle of November. Permission was then given to Mr. Trehaki to use stone from the Dowaiga quarries, which are comparatively close to the site, and since then progress has been satisfactory. About half the masonry work is now complete.

Mr. Trehaki's contract expires on the 1st of June next.

Owing to the Adviser's decision to discontinue the use of béton armé, the floors and roofs of the buildings were redesigned in girders and

brick arches, and the verandahs in timber. These changes resulted in an economy of L.E. 400. Both the floors and verandahs are being built by Mr. Trehaki.

Of the other items not put up to adjudication, the asphalt roofing and paving have been intrusted to the Neuchatel Asphalt Company.

The roofing asphalt will be laid in 2 separate coats, the Company guaranteeing them for 10 years. Our estimate on this item will be exceeded by L.E. 300. Mosaic pavement will be employed throughout the Hospital proper.

With the exception of the painting, which must necessarily be postponed till the plastering is dry, all subsidiary works will, I hope, be finished at the time fixed for the expiration of Mr. Trehaki's contract.

Mistresses' House, Samieh School.—A house for the English Mistresses is now under construction in the grounds of the School. The foundations were finished last August, and the remainder of the building was then put up to adjudication and allotted to Mr. Basile Antoniou who built the School. The house should be finished by the end of April. Arrangements have been made by which, during the progress of the work, the site is entirely isolated from the rest of the School grounds.

Mubtadian and Normal Schools.—For the Normal School a first floor containing 5 class rooms was added; this work being carried out during the holidays, and completed in time for the opening of the schools. The contractors were Messrs. Ghezze and Fedrigo.

Mubtadian School Gymnasium Shed.—Small additions were made to the Primary School. A Gymnasium Shed has been ordered.

At the Mubtadian School the modifications consist in a Prayer Room, a Gymnasium Shed and small additions. With the exception of the Gymnasium Shed, which has just arrived in the country, the works are completed.

Ezbekieh Gardens refreshment bar.—This building is practically finished. It is situated near the bandstand and will, it is hoped, be largely used by the public who visit these gardens.

Egyptian Museum Balustrades.—The solid masonry parapets in the Galerie d'Honneur on the first floor of the Egyptian Museum have been replaced by marble balustrades which were brought from the Ghizeh Palace.

Mansourah and Benha Tribunals.—These Tribunals are very nearly completed. They are of the ordinary type.

Zagazig Prison.—At Zagazig Prison a storey has been added to the old prison block, and well-ventilated latrines separated from the building, have been added to each storey.

Manshia Prison.—At Manshia Prison a laundry and hospital have been added to the women's quarter.

COMMISSION FOR THE EXAMINATION OF STATE BUILDINGS.

The Commission represented by MM. Clifton, Pastour, Schaufele, and de Cosson reported on the following old public buildings:—

Ministry of Finance,
Stores and School for Police at Boulac,
Ministry of Public Works,
Khedivial Opera House,
Ministry of Justice,
Foreign Office,
Ministry of Public Instruction,
Cairo Governorat,
Cairo School for Arts and Crafts.

The most important report was that on the Khedivial Opera House, in the preparation of which the Commission had the assistance of Mansfield Pasha. It recommended most strongly the reconstruction of the theatre. The Committee recommended urgent repairs in nearly all the buildings. These have generally been carried out, but in many cases they, by the force of circumstances, consisted only of patchwork, the buildings being in a state which necessitates entire reconstruction.

Of works, other than buildings-construction carried out by this Office, that of lowering a big rock behind the Citadel was the most important. A description is given in appendix I.

Appendix II gives in detail the cost (1.01 % of the estimates) of preparing 21 projects. This is slightly higher than our figure for 1903, which was 0.942. This excess is accounted for by the extra time devoted to the study of the projects. In the case of the Mistresses' House for the Sanieh School, the high percentage of 4.76 was due to the first project being entirely remodelled.

APPENDIX I.

Report on dislodging rock threatening the mosque El-Magawri.

The Public Works Department were asked by the Egyptian Army to remove the big rock shown in photos A and B which threatened to fall on to the out-buildings of the Mosque El-Magawri situated 7 metres horizontally from the foot of the cliff, and 25 metres vertically below the rock.

This rock was loosened by the explosion which occurred in January 1903; according to the Royal Engineer's theory, the whole face of the cliff was lifted and dropped into its former position.

This seems extremely probable, as the rock in this neighbourhood is fissured in all directions.

Photo D, taken instantaneously when a small block of 10 tons was being dislodged gives a good idea of the abrupt angle of the cliff.

Before attempting to dislodge the big rock, it was decided to make a dam of quarry debris stretching from the big block on the right in photo F (which fell at the time of the explosion) to the foot of the cliff. The object of this dam was to form a cushion to prevent the big rock when dislodged from rolling on to the building to be protected. In Photo E a man is shown standing on this dam; a-b is the edge of the building. Behind the man, the dam shows an indent of about one metre caused by the impact of the rock when it fell. This indent is 1m. 80 from the building. The main impact was taken by the dam.

A good deal of time and money was spent in making the cliff accessible. This was absolutely essential for directing the work and to ensure the safety of the workmen. Sealing ladders and ropes were fixed and steps cut in the rock to attain this object. It was impossible to ascertain the degree of stability of the rock. The quarryman believed it to be deeply rooted into the cliff. For the safety of the workmen life lines were attached to 3-inch wooden pegs jumped into the ledges behind and above the rock. These life lines, by giving confidence to the men, very materially assisted the work.

It was decided not to use explosives to dislodge the rock, but to break it up into pieces of about 50 tons by means of :—

- | | |
|--|----------------------|
| 1.—A line of holes filled with quick lime | } Subsequently water |
| 2.—A line of holes filled with hard wood wedges... | |

Photo C shows the tank on the left, the pipes used to supply water to the 12 quick lime holes, and the trough for the water for the wooden wedges.

The water was turned on to these two systems in one afternoon, in anticipation of either the quicklime bursting the rock in half an hour, or the wooden wedges in 24 hours.

At nightfall, four hours after the water had been turned on, the quicklime had apparently no effect, and work was knocked off after several heavy stones had been dislodged round the base of the big rock. This no doubt had the effect of loosening it, as on the following day the entire rock fell, carrying with it the water tank and pipes. It landed safely as shown in photo E.

In falling the rock did not break up, but turned over so that the wooden wedges could no longer be kept wet and, though the line of quicklime holes resisted the shock of the fall, two days later it was noticed that the rock had broken off at this line. The quicklime therefore acted eventually, though we cannot state the exact period. It was certainly more than 30 hours.

Though the dangerous portion of the work was thus disposed of, there remained another block of some 15 tons which, owing to the shape of the shelving cliff below it, threatened, when dislodged, to land on the roof of the building.

This block was successfully steered by a live-inch rope, attached to an eye bolt fitted into the stone, and an anchor 20 metres off let into the cliff; as the stone slid down the rope drew it away from the gulley leading to the building, and guided it over the safe edge of the cliff where the rope, having done its work, snapped at the eye.

Mr. Curtis, junior, was charged with the execution of Mr. Clifton's carefully prepared scheme, and deserves great credit for bringing a dangerous job to a successful conclusion without damage to life or property.

LIST A.

WORKS TAKEN OVER FINALLY.

No.	NAME OF WORK	Sanction.	Expenditure.
		L.E.	L.E.
<i>Egyptian Museum.</i>			
1	a) — Residence for Secretary General	4,900	3,854
	b) — Workshops and Shed	3,930	3,089
	c) — Boats Lodge, boundary wall and latrines.	3,415	3,016
2	Supplementary works, Arab Museum	1,200	1,291
3	Carro School of Law	24,725	21,426
4	Completion of Port Said Governorat	15,000	15,000
5	Port Said Post Office... ..	25,325	22,249
6	Shibin-el-Kom School	8,000	7,912
7	Police Barracks, Kom-Hamada	3,370	2,957
Total... ..		89,365	80,791



ROCK BEFORE WORK.



ROCK AFTER WORK, SHEWING DAM & WALL, A. B.

LIST B.

WORKS TAKEN OVER PROVISIONALLY.

No.	NAME OF WORK.	Sanction.	EXPENDITURE.		
			During 1904.	Before 1904.	Total.
		L.E.	L.E.	L.E.	L.E.
1	Sanieh Girls' School	31,625	9,932	17,290	27,222
2	Cairo Central Fire Brigade Station and Police Barracks	29,100	10,328	16,187	26,515
3	Cairo Mixed Tribunal, additions ...	9,500	3,007	4,606	7,613
4	Book and Exhibition Cases, Khedivial Library	8,000	5,058	2,289	7,347
5	Police Barracks, Belbeis... ..	3,925	929	2,521	3,450
6	Police Barracks, Tanta	3,800	2,207	1,631	3,938
7	Changing Skylights, Egyptian Museum	2,500	939	1,451	2,310
8	Mariette Pasha's Statue	2,220	1,329	891	2,220
	Totals... ..	90,770	33,829	46,866	80,695

LIST C.

WORKS IN COURSE OF CONSTRUCTION.

No.	NAME OF WORK.	Sanction.	EXPENDITURE.		
			During 1904.	Before 1904.	Total.
		L.E.	L.E.	L.E.	L.E.
1	Egyptian Army Hospital Abbassieh.	10,000	3,066	—	3,066
2	Mistresses' House Sanieh Girls' School	4,000	988	—	988
3	Mubtadian and Normal Schools ...	2,850	2,188	—	2,188
4	Mubtadian School Gymnasium shed	1,042	—	—	—
5	Ezbekieh Garden Refreshment Bar.	2,548	887	—	887
6	Egyptian Museum Balustrades ...	800	461	—	461
7	Mansourah Summary Law Court...	5,150	1,934	1,772	3,706
8	Benha Summary Law Court	4,400	2,832	—	2,832
9	Prison at Zagazig	—	—	—	—
10	Manshia Prison... ..	—	—	—	—
	Totals	30,790	12,356	1,772	14,128

Part of L.E. 24,000 for completion.

APPENDIX II.

PROJECTS PREPARED IN 1904.

No.	NAME OF PROJECT	Number of Sightmen	Number of Hours worked 1904	SALARIES OF DRAWINGS MEN				(B) Estimated cost of work exclusive of contingencies	Total cost of work including contingencies	REMARKS
				1902	1903	1904	(A) Total			
				L.E. M.	L.E. M.	L.E. M.	L.E. M.	L.E. M.	L.E. M.	
1	E. A. Hospital, Abkhush	...	1,152	—	—	161 259	161 259	24,340 000	0 55	
2	Sandeh School	...	1,171	—	15 083	143 054	158 137	3,344 000	1 76	
3	Tewfikieh School	...	55	27 836	21 172	7 384	37 292	5,808 000	1 01	
4	Kemalieh School	...	85	—	7 430	13 380	20 710	—	—	Preliminary Project only.
5	Shedinet-Koun School	...	20	16 737	11 983	2 260	31 000	1,009 000	2 11	
6	Mohattin and Normal Schools	...	118	7 255	5 141	17 024	29 139	2,621 000	1 12	
7	Police School, Bulak...	...	95	—	—	10 750	10 750	—	—	Preliminary Project only.
8	Adana School	...	68	—	—	7 684	7 684	1,151 000	0 65	
9	Benin School	...	230	18 965	64 215	10 610	102 790	15,924 000	0 61	
10	Law School	...	202	27 291	21 656	18 272	67 219	—	—	Preliminary Project only.
11	Husseini School	...	114	—	190 255	12 982	133 137	11,232 000	0 92	
12	Cairo Mixed Tribunal	...	165	64 721	83 491	14 183	162 395	5,740 000	2 00	
13	Benia Summary Law Court	...	121	6 083	3 738	13 390	23 111	3,648 000	0 64	
14	Mansurah Summary Law Court	...	117	0 778	9 025	18 281	28 195	3,152 000	0 81	
15	Seinbelawin Summary Law Court...	...	30	1 376	1 820	1 980	5 216	3,620 000	0 13	
16	Kaf-el-Zayat Summary Law Court.	...	84	—	—	6 169	6 169	3,500 000	0 17	
17	Facna Summary Law Court.	...	10	—	—	2 875	2 875	3,500 000	0 08	
18	Santa Summary Law Court	...	37	—	—	2 777	2 777	3,500 000	0 09	
19	Typophia, Summary Law Court	...	146	—	63 618	12 919	76 565	3,291 000	2 39	Alterations do.
20	Cairo Fire Station	...	142	15 846	40 577	12 329	70 762	—	—	
21	Bulak Canal	...	83	—	—	11 088	11 088	3,000 000	0 22	
22	Matarieh Canal	...	20	—	58 082	2 320	60 412	(exp'd)	1 68	Extra works Alterations.
23	Arab Museum	...	50	16 396	7 540	6 250	29 149	3,298 000	3 62	
24	Ezbekieh Garden's Bar	...	407	—	3 680	43 101	47 081	1,300 000	—	
25	Police Stables	...	31	—	—	3 686	3 686	—	—	
26	Zaffa Post-Office	...	27	—	—	3 222	3 222	—	—	
27	Kaer-el-Nil Bridge	...	12	—	—	1 116	1 116	—	—	
28	Markaz Bulbels	...	39	14 192	15 363	3 961	33 194	3,491 000	0 95	Repairs to pylons
29	Markaz Toubis	...	85	35 002	16 132	6 441	58 265	2,775 000	2 10	
30	Typo Markaz	...	317	6 480	21 777	25 861	54 078	—	—	
31	Contingencies	...	1,293	—	—	142 370	142 370	—	—	
	Totals...	...	6,912	261 701	597 662	117 700	1,067 132	118,067 000	1 01	as shown in 21 projects.

CHIEF INSPECTION SOUTH.

The actual cost of buildings completed in the year under review only amounted to L.E. 5,690. The amount spent on buildings under construction was L.E. 54,290, and the total amount sanctioned was L.E. 128,384.

Expenditure on additions and repairs to 160 buildings came to L.E. 4,947. Of the larger repairs L.E. 434 was spent on the Girga Mudiriyyah at Suhag, and L.E. 526 on the repairs to Abnub Markaz.

Fayum Tribunal.—This, with some modifications, is of the type adopted for district Tribunals (in brickwork). The cost, inclusive of boundary wall and railing, Pump House, and latrines, was L.E. 4,254 per sq. metre.

Small Pavilion, Helwan.—This was a special design made to meet the requirements of the Survey Department. The cost was L.E. 2,725 per sq. metre.

New Drawing Office, Survey Department.—This was a first floor put upon an existing building at Ghizeh. The cost was L.E. 2,419 per sq. metre.

Printing Office Extension, Survey Department.—This building of an area of 261 m² was erected to meet the increase of work now being done in this Department. The cost was L.E. 3,545 per sq. metre.

Fire Engine Stations.—A small grant of L.E. 600 was sanctioned by the Ministry of Finance to enable us to build 6 more Fire Engine sheds in Upper Egypt to the type designed by Mr. Hewat.

These have been completed; an additional one was built at Ghizeh Markaz, and was paid for by the Municipality. There are now 18 Fire Engine sheds in Upper Egypt.

The buildings in the list of Buildings let to contract in 1904 and still under construction, estimated at L.E. 128,000, will be dealt with in my report for 1905.

The work done in the drawing offices during the year 1904, consisted of 441 original plans and 558 copies on tracing cloth for blue prints. As no contract is put to adjudication without a complete set of plans, fully detailed, there are 66 plans in the contract for the Asyut Model Workshop, 28 plans for the Aswan post office, 48 for the Mudiria at Asyut. Other buildings are represented by plans in proportion to their importance.

List of Buildings let to contract in 1904 and still under construction.

Number	Town.	Name of Building.	Approximate Date of completion.	Solomon's estimates.	Spent in 1904.	REMARKS
				L. E.	L. E.	
1	Asyut ...	Muderiya	June, 1905 ...	15,828	5,996	
2	" ...	Model Workshop	October, 1905 ...	16,000	2,369	
3	Aswan ...	Post Office	January, 1905 ...	3,782	2,418	
4	" ...	Tribunal	February, 1905 ...	3,850	1,618	
5	Tahla ...	Markaz and Police barracks	March, 1905 ...	3,100	2,067	
6	Ginzei ...	Polytechnic Schools	February, 1905 ...	32,954	13,200	L. E. 9,909 was spent in 1903.
7	Feshi ...	Platform Post Office	March, 1905 ...	376	—	
8	Beni-Mazar ...	" "	March, 1905 ...	376	—	
9	Asyut ...	Prison	June, 1905 ...	25,107	13,113	
10	Kena ...	"	June, 1905 ...	17,486	10,361	
11	Magaga...	Fire Engine Station	January, 1905 ...	125	—	
12	Beni-Mazar ...	"	March, 1905 ...	95	—	
13	Faynu ...	School	May, 1905 ...	9,300	3,118	
		Total	Total ...	128,381	54,200	

Class-room area, etc.

British Government Regulations.

Class of School.	Square ft. per head.	Square metres per head.	Cubic ft. per head.	Cubic metres per head.	REMARKS.
Blind and deaf children (minimum allowance).	20	1.858	240	6.795	
Infant	9	0.826			
Other children	10	0.929			
High grade schools	15	1.393			Felix Clay, "Modern School Buildings."
Secondary	18	1.672			
•Elementary	10	0.929			
Higher Elementary (according to type of desks).	13 to 18	1.208 to 1.672			
Minimum recommended by J. Osborne Smith F. R. I. B. A.	15	1.393	200	5.663	Sanitary Institute Conference, Feb., 1905. See below.

NOTE.—Felix Clay, says (page 88 "Modern School Buildings") that no advantage is gained by making class-rooms over 12 ft. high.

• Board of Education Regulations, J. Osborne Smith F.R.I.B.A., Sanitary Institute Conference, February, 1905. "Public Health Engineer," Vol. XVI, No. 105 page 122.

Class-room area, etc.

English and Egyptian Schools.

Name of School.	Square ft. (per head.	Square metres per head.	Cubic ft. per head.	Cubic metres per head.	REMARKS.
<i>English.</i>					
Schools of the Girls' Public Day-School Co.	18 $\frac{1}{2}$	1.254			"Modern School Buildings," page 88, F. L. C. Clay.
School for Boys' Barnards (Inn)... ..	10 $\frac{1}{2}$	1.719			
Judd Commercial School	16 $\frac{1}{2}$	1.533			
St. Paul's—West Kensington	17 $\frac{1}{2}$	1.626			
City of London Schools... ..	13 $\frac{1}{2}$	1.254			
<i>Egyptian.</i>					
Benha and Hussenieh Schools	19 $\frac{3}{4}$	1.837			Projects 1903.
Osmanieli Secondary School (single desks)	24 $\frac{1}{2}$	2.255	398 $\frac{1}{2}$	11.275	Project 1905—12 boys per class.
Fayoum (1905) and Esneh Schools (Double desks) ...	30 $\frac{1}{16}$	2.800	494 $\frac{1}{2}$	14.000	Esneh 1899-1900, Fayoum 1904-1905—35 boys per class.
Chobin-el-Kom School	17 $\frac{1}{16}$	1.630	368 $\frac{3}{4}$	10.441	1903
Sanieh Girls' School	21 $\frac{1}{2}$	1.970	431 $\frac{1}{2}$	12.214	1900-1901
Khedivial Law School	25 $\frac{7}{16}$	2.40	466 $\frac{1}{2}$	13.200	1900-1903.

Class-room area, etc.

German and Swiss Schools.

Name of School.	Square ft. per head.	Square metres per head.	Cubic ft. per head.	Cubic metres per head.	REMARKS.
German Schools.					
Hohere Burgerschule	15	1.393			Felix Clay, "Modern School Buildings," page 87.
NH Realschule, Berlin	15	1.393			
New Buildings, Fossings Gymnasium Berlin, Lower forms	13	1.208			
" " Higher "	15	1.393			
Realschule, Karlsruhe	17	1.579			
Swiss Schools.					
Schunderschulehaus., Zurich	40	1.858			"Modern School Buildings," page 87.
Tochterschule, Basle	16	1.486			
Madchenschulehaus., Zurich	17	1.579			

NOTE.—On page 103 Felix Clay says that elementary schools in Berlin have only 8 to 9 sq. ft. per head.

Mr. RICHMOND'S OFFICE.

I.—ZAGAZIG MUDIRIA.

The demolition of half the old Mudiria buildings was, as reported last year, completed by the end of 1903.

The progress of the work during 1904 has been as follows:—

Tribunals.—The excavations for the new Tribunals were completed on the 9th of January. On that day the foundation bed was examined, and instructions given to the contractors to lay the concrete. Since that date the work has steadily progressed. The painting and colour washing is now nearly completed. A scheme for a temporary water supply, to fulfil the needs of the building until the general water supply project is ready, is being prepared.

Markaz.—The excavations for the new Markaz were completed on the 20th March. This building is being constructed “*pari passu*” with the tribunals.

Quarters for the Police Bandar.—The foundation for the Police Quarters was laid on the 10th May. This building, for reasons reported last year, is being constructed half at a time. The first half will be ready for occupation at the same time as the Tribunals and the Markaz. All should be completed in the beginning of April, 1905.

II.—REVISION OF THE “*SERIE DES PRIX.*”

This work was begun in January, and proceeded with in accordance with the instructions received from Head-quarters. Revision was confined to prices; the existing specifications were considered satisfactory.

A list of those items for which prices were most urgently needed was compiled; copies were forwarded to the Inspectors, with a request to quote rates for Cairo work, carried out in accordance with the printed specifications since January, 1897.

The statistics received were too incomplete to be of value. Rates based on executed work for more than 700 items were asked for; those for 26 only were returned. The reason is that it is seldom possible to compare the specifications for executed works, with those of the printed

Serie. The first are for new works while the latter have to meet the more elaborate requirements and varying conditions of repairs. It was, therefore, necessary to abandon the idea of accomplishing the Revision from data afforded by executed work alone. In consequence it was decided to ask various contractors to quote rates for which they might be willing to carry out works in Cairo as specified in the existing serie.

As a test of this method, four selected contractors were asked to price the items in serie No. 1 dealing with Terrassements.

On comparing the results it was found that none of the contractors agreed within very wide limits as to the current cost of day labour, of materials, or work including labour and materials. For so simple an item as the pay of a day labourer the rates quoted vary up to nearly 100%. For the more complicated items the differences are frequently greater.

It is evident either that contractors do not possess any generally accurate knowledge of the cost of works, or that a very large unforeseen is added to meet perpetually fluctuating conditions and rates. By comparing the prices given in any tenders for the erection of buildings one is forced to the same conclusion.

Since this is so, it would be useless to prepare a "Serie des prix" for general use and publication.

In the meantime, for our own use and to constitute a working basis, the work will be continued, and the result will provide a large amount of information useful for the preparation and checking of estimates.

III.—PRIMARY SCHOOL AT ZAGAZIG.

In March, 1904, this office was directed to prepare preliminary plans and estimates for a Primary School, destined to accommodate 400 pupils, of whom 100 would be boarders.

Accommodation.—A detailed study of the needs of the School was made with Mr. Holt of the Ministry of Public Instruction, and a schedule of accommodation, showing the proposed distribution of the various school buildings, with a list of rooms needed in each, was drawn up and submitted to the Ministry of Public Instruction for approval.

This schedule was returned on the 20th June, approved.

On the 27th July notice was received that the formalities in connection with the purchase of a site had been completed.

Preliminary Plans.—The preparation of preliminary plans was not, however, proceeded with, as information was received to the effect that no money for the execution of the building in 1905 would be forthcoming.

IV.—REST HOUSES FOR THE MINISTRY OF JUSTICE AT ZAGAZIG.

In March, 1904, this Office was entrusted with the preparation of plans for these Rest Houses.

Preliminary plans were prepared and approved. Working drawings, together with specifications and quantities, were put out to tender in November, 1904. The tender amounting to L.E. 1,696, submitted by Messrs. Ghezso and Fedrigo, was accepted.

Work was begun on the 12 December.

V.—POST OFFICE AT ZAGAZIG.

On the 19th April, 1904, instructions were received to prepare preliminary plans and estimates for a new Post Office at Zagazig.

Mr. Béchara Karam of the Post Office Administration provided the necessary information regarding the accommodation required.

Preliminary plans were prepared, and were approved by the Director General of the postal Service. The plans were then submitted to the Finance Committee and approved, with the exception of the accommodation for the Director of the Post Office. Instructions were received to prepare the Contract drawings, omitting the apartments destined for the Director.

These plans, together with the specifications and quantities, will be ready to put out to tender early in 1905.

VI.—BUILDINGS FOR TESTING MEASURES AT HELWAN.

In April, 1904, Plans and Specifications were prepared for the above-mentioned buildings. Messrs. Kuressios and Allam contracted for their erection. Work was begun on April 21st, and the buildings were handed over to the Survey Department on the 2nd October. The cost of the work amounted to L.E. 443.

VII.—HOUSE IN THE ZOHRIA GARDEN, GEZIRA, CAIRO.

In May, 1904, the Ministry of Finance entrusted this office with the preparation of plans for altering and enlarging an old house in the Zohria Garden.

A sum of L.E. 2,500 was allotted to this work. The contractors were Messrs. Karessios and Allan; the work was finished in December, 1904.

VIII.—NEW POLICE SCHOOL.

In October, 1904, instructions were received to prepare plans for a proposed New Police School to accommodate 660 pupils and the necessary staff.

A detailed study of the needs of the School was made, and negotiations regarding the choice of a site were undertaken.

Preliminary plans and estimates are now being prepared.

IX.—PROPOSED NEW BUILDINGS FOR THE MINISTRIES OF FINANCE AND THE INTERIOR.

In October, 1904, this Office was instructed to undertake enquiries regarding the needs of these Administrations, and to examine possible sites for the new buildings.

Schedules of accommodation for all the departments of these Ministries were prepared.

Preliminary plans can be begun as soon as a decision has been arrived at regarding the composition of the Ministries.

It is not finally decided which of the departments are to be accommodated in the Ministry buildings, and which are to be otherwise provided for.

INSPECTION EAST.

The total sum spent on repairs was L.E. 18,053. Of this L.E. 7,055 was on ordinary, and L.E. 10,998 on special budget.

The L.E. 7,055 represents 198, and the L.E. 10,998 twelve separate works.

Details are given in the appendices.

The various Ministries benefited in the following proportion :

Interior	L.E. 12,917
Justice ... ..	.. 182
Finance ... ..	.. 2,444
Public Instruction ... ..	.. 1,894
Public Works Department ... ..	.. 616
	<u>L.E. 18,053</u>

Purely Sanitary work accounted for L.E. 754. A large proportion of the time of the Inspectors and Tanzim Engineers is taken up in attending to the work of the Local Commissions. This is treated separately under the latter head.

During Mr. Chapman's absence on sick leave his duties were carried out to my entire satisfaction by Mr. Berger.

Table showing total number of buildings repaired and Expenditure on same.

INSPECTION.	Total number of buildings repaired.	Total spent on				Grand Total spent.	
		Ordinary Budget.		Special Credit.			
		L.R.	M.	L.R.	M.	L.R.	M.
East	95	7,055	175	10,997	487	18,052	662

List of Works executed in 1904.

SPECIAL CREDITS.

Number.	Description of Work.	SUMS SPENT.			
		Per work.		Per Ministry.	
		L.E.	M.	L.E.	M.
	<i>Ministry of Interior.</i>				
1	Port Said Hydrants... ..	2,900	—		
2	Repairs for new accommodation in Port Said Governorat's annexes... ..	1,500	—		
3	General repairs to roofs of Port Said Police Barracks	600	—		
4	Remodelling latrines and new percolating pit for Port Said Police Barracks ...	90	—		
5	Port Said Native Charcol (including supplementary works)... ..	3,014	—		
6	Markaz Fakos new premises for fire pump	100	—		
7	Damietta, Replastering walls of an old shoonah	100	—		
8	Masonry boundary pillars for following cemeteries:—				
	Markaz Hehin Hod Nogueh	15	—		
	" " " "	4	—		
	" " Ibrahimiah	12	—		
	" " Farsiss	4	—		
	" " " "	6	—		
	" " El Edwa	6	—		
	<i>Carry forward...</i>	8,351	—		

List of Works executed in 1904—continued.

SPECIAL CREDITS.

Number.	Description of Work	SUMS SPENT.			
		Per work.		Per Ministry.	
		L.E.	M.	L.E.	M.
	<i>Brought forward...</i> ...	8,351	528		
	<i>Ministry of Interior—continued.</i>				
	Mansourah: Salamon Komashé	10	—		
	.. Mit-Amel	13	—		
	.. Nawassa-el-Ghet	16	—		
	Mit-Samanood: Agun	18	—		
	Fareskoor: Char Massah... ..	13	—		
	Total L.E.... ..			8,421	528
	<i>Ministry of Finance.</i>				
1	Port Tewfick: Premises for P. & L. sailors	1,500	—		
	<i>Ministry of Public Works Department.</i>			1,500	—
1	Matarieh: Converting an old shoona into a Tanzin Office	200	—		
	<i>Ministry of Public Instruction.</i>			200	—
1	Port Said School: Macadamizing grounds	850	—		
2	Laying down pipes and box-hydrants ...	25	959		
	Total... ..	—		875	959
	GRAND TOTAL L.E.	—		10,997	487

List of Works, Repairs, &c., executed in 1904.

Nos.	Locality.	Number of works	From L.E. 0 to L.E. 10.		From L.E. 10 to L.E. 100.		From L.E. 100 to L.E. 200.		From L.E. 200 to L.E. 1000.	
			L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.
1	Mansourah ...	38	160	167	264	275	731	588	220	069
2	Damietta ...	28	130	409	212	208	494	845	—	—
3	Sembellawein ...	5	17	551	59	721	—	—	—	—
4	Port Said ...	44	108	991	404	133	462	744	300	—
5	Ismailiah ...	14	21	254	276	016	212	968	—	—
6	Suez ...	24	51	498	206	052	343	986	—	—
7	Port Tewfik ...	20	41	022	383	194	138	870	—	—
8	Benha ...	3	5	950	139	778	—	—	—	—
9	Minet El Gamh ...	2	9	210	—	—	199	716	—	—
10	Zagazig ...	1	27	791	72	876	—	—	—	—
11	Faccous ...	2	9	199	—	—	119	102	—	—
12	Matarieh ...	4	23	450	50	—	—	—	—	—
13	El Arich ...	1	1	667	20	—	—	—	—	—
14	Moses Well ...	2	—	—	51	228	—	—	450	—
15	Tel El Kebir ...	1	—	—	47	924	—	—	—	—
16	Mit Ghamr ...	3	—	—	89	196	107	992	—	—
17	Kufr Sakr ...	2	—	—	58	832	—	—	—	—
18	Helia ...	1	—	—	—	—	—	—	300	—
Totals ...		198	607	862	2,335	433	2,841	811	1,270	069

General Total... L.E. 7,055 175.

List of Works executed for different Departments in 1904.

Nos.	Locality.	Number of Works.	Amount Total.		Totals.	
			L. E.	M.	L. E.	M.
<i>Ministry of Interior.</i>						
1	Port Said	33	9,186	513		
2	Ismailieh	6	317	786		
3	El Arich... ..	2	21	667		
4	Suez	10	126	873		
5	Port Tewfik... ..	5	159	943		
6	Moses Well	2	501	229		
7	Mansourah	24	714	518		
8	Damietta... ..	14	615	820		
9	Faresconr	1	13	—		
10	Mit Samanoud	1	18	—		
11	Mit Ghamr	2	89	196		
12	Sembellawein... ..	5	77	272		
13	Mutarieh... ..	1	8	480		
14	Benha	3	145	528		
15	Kafr Sakr	1	58	832		
16	Hehia	7	347	—		
17	Faccous	3	258	829		
18	Minet Gamh	2	208	916		
19	Tel-el-Kebir	1	47	924		
	Total L.E.	—	—		12,917	326
<i>Ministry of Justice.</i>						
1	Ismailieh	3	55	535		
2	Mit-Ghamr	1	107	992		
3	Damietta... ..	3	18	938		
	Total L.E.	—	—		182	465
	Carry forward L.E.	—	—		13,099	791

List of Works executed for different Departments in 1904—continued.

Nos.	Locality.	Number of Works.	Amount Total.		Totals.	
			L.E.	M.	L.E.	M.
	<i>Brought forward</i>	—	—		13,099	791
	<i>Ministry of Finance.</i>					
1	Port Said	6	22	051		
2	Ismailieh	4	123	718		
3	Suez	3	59	783		
4	Port Tewfik	15	1,904	414		
5	Mansourah	5	324	183		
	Total L.E.	—	—		2,444	149
	<i>Ministry of Public Instruction.</i>					
1	Port Said	7	896	645		
2	Suez... ..	4	371	601		
3	Mansourah	14	368	655		
4	Damietta... ..	8	258	179		
	Total L.E.	—	—		1894	080
	<i>Public Works Department.</i>					
1	Port Said	9	152	237		
2	Suez... ..	9	76	794		
3	Mansourah	1	7	974		
4	Damietta... ..	3	17	899		
5	Matarieh... ..	2	263	970		
6	Zagazig	7	95	768		
	Total L.E.	—	—		614	562
	GENERAL TOTAL L.E.	—	—		18,052	662

List of Sanitary Works executed in Inspection East in 1904.

Nos	Subject.	Cost		Totals.	
		L. E.	M.	L. E.	M.
<i>Ministry of Interior.</i>					
1	Port Said Police Barracks:— New Patent native slabs to latrines, and new percolating pit for same	90	—		
2	Petty sanitary repairs in Port Said Govern- orate	11	380		
3	Public latrines Meedan de Lassege at Port Said, petty repairs	2	774		
4	Mudiryah Dakaliah repairs to force pump of latrines	3	590		
5	Mansourah Mixed Law Courts new man- hole cover to tight fosse	2	915		
6	Port Said Police Barracks:— Repairs to a percolating pit	3	778		
7	Port Said Telegraph Office:— Repairs to men's W. C.	4	380		
8	Port Tewfik Quarantine Office:— New flushing System to W. C's	2	990		
9	Mudiryah Dakaliah:— Whitewashing latrines	4	396		
	Total L.E.	126	113	126	113
<i>Ministry of Finance.</i>					
1	Mansourah Post Office:— Sanitary modifications to drainage	133	309		
2	Director of P. and L's house at Port Tewfik: Repairs to W. C's and bath room	43	655		
3	Suez Post Office:— Repairs to latrines	9	448		
	<i>Carry forward.</i>	312	525		

List of Sanitary Works executed in Inspection East in 1904—continued.

Nos.	Subject.	Cost.		Totals.	
		L.E.	M.	L.E.	M.
	<i>Brought forward.</i>	312	525		
	<i>Ministry of Finance.</i>				
4	Port Said Coast Guards' Commanding Officer's quarters: Repairs to W. C's	3	172		
5	Mansourah Post Office: Erection of a flushing tank	9	575		
	Total L.E.	325	272	325	272
	<i>Public Works Department.</i>				
1	P. W. D's Inspection house at Suez: Remodelling of latrines	29	862		
2	Matarieh Tanzim Office: Emptying tight fosse... ..	4	990		
	Total L.E.	—		34	852
	<i>Ministry of Justice.</i>				
1	Ismailiah's Mekemah Shariah: Building a new latrine	39	880		
2	Supplementary work for ditto	1	607		
	Total L.E.	—		41	487
	<i>Ministry of Public Instruction.</i>				
1	Suez Primary School: Remodelling old latrines and new drain to sea	198	438		
2	do. do. do.	145	518		
3	Mansourah Professional School: Petty repairs to latrines	6	980		
4	Port Said Primary School's head master's quarters: Petty repairs to W. C.	1	482		
	Total L.E.	—		352	448
	GRAND TOTAL L.E.	—		754	059

Table showing Towns under Tanzim Regulations.
Towns which have municipal or local Councils, and number of inhabitants.

Under Tanzim Regulations.	Municipal or Local Councils.	Number of Inhabitants
Zagazig	Local Board	35,715
Mansourah	Municipal Board	36,131
Mit Gaur	Local Board	12,983
Suez	"	17,173
Damietta	"	31,288
Port Said	none	42,328
Ismailia	"	6,886
Port Tewfik	"	7,797
Mutariéh	"	12,236
Benha	Local board	8,462

Tanzeem Rokhsas delivered in 1904.

Years.	Towns.	For Buildings and repairs.	For Occupation of the public way.	For Verandahs.	Totals.	Receipts
						L.E. M.
1904	Zagazig ...	424	507	31	962	500 845
"	Suez ...	90	160	3	253	169 184
"	Port Said ...	302	482	58	842	577 542
"	Ismailia ...	62	—	—	62	20 900
"	Damietta ...	281	147	5	433	193 060
"	Mansourah ...	377	—	31	411	101 600
"	Mit Gaur ...	246	135	17	398	142 755
"	Benha ...	122	128	3	253	145 786

Expropriation and sale of Ziadet Tanzim.

Years.	Towns.	Expropriations.			Ziadets sold.		
		Areas.	Sums paid.	Rate of M ²	Areas.	Sums received.	Rate of M ²
		M ²	L.E. M.	L.E. M.	M ²	L.E. M.	L.E. M.
1904	Zagazig ...	180·43	109 304	0 605	221·03	108 190	0 489
"	Suez ...	68·10	41 265	0 650	—·81	1 —	0 200
"	Mansourah ...	505·55	51 783	0 110	113·42	71 751	0 635
"	Damietta ...	127·22	36 018	0 290	1067·19	139 564	0 130
"	Mit Gaur ...	28·06	5 612	0 200	55·84	28 168	0 505
"	Benha ...	319·81	201 559	0 630	13·62	17 665	1 297

Name of Town.	Total number of Contraventions.	LAW-SUITS.	
		Gained.	Lost.
Tanta	103	100	3
Kufr-el-Zayat... ..	7	7	—
Mehalla-el-Kobra... ..	13	11	2
Talkha	—	—	—
Samannud	—	—	—
Zifta... ..	8	4	4
Chibin-el-Kom	5	5	—
Kuesna	—	—	—
Mennf	2	2	—
GRAND TOTAL	138	129	9

List showing revenues of Tanzim Offices in 1904.

Name of Town.	Sale of Building Rakats.		Permits for temporary occupation of Roads.		Permits for permanent occupation of Roads (pipes).		Sum Total for each Town.	
	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.
Zagazig	123	170	376	905	9	770	509	845
Suez..	30	360	120	829	18	995	179	181
Port Said	141	830	435	912	174	690	752	432
Ismailieh	20	900	—	—	—	—	20	900
Mansoura	101	600	255	065	4	550	360	215
Damietta..	86	720	103	—	3	340	193	060
Mit Ghamr	68	400	74	105	0	250	142	755
GRAND TOTAL L.E.							2,159	391

WEST INSPECTION.

New Works.—A new Tribunal was built at Minet-el-Bassal at a cost of L.E. 4,700.

Repairs and New.—A total sum of L.E. 12,033 of which 5,000 on normal and 7,033 on special budget was spent in 1904 representing 211 separate works.

The subdivision according to Ministries is as follows:—

Interior..	...	...	...	...	...	...	2,410
Finance..	...	...	...	...	...	...	1,888
Public Works Department	...	...	...	...	...	...	699
Public Instruction	...	...	...	...	...	...	40
Justice..	...	...	...	...	...	...	5,520
Khedivial Palace..	...	...	...	...	...	...	196
							<u>12,033</u>

The following works have been carried out:—

	L.E.
1° Asphalting roof Quarantine parks at Mex	230
2° Refection kitchen Quarantine Charby	200
3° Gross repairs to Mixed prison Gabari	470
4° " " " Post-Office	550
5° Repairs to Markaz Abou-Honamos... ..	210
6° Repairs and modifications to Mudrich Behera, Mehkeweh Charieh and Tanzim Office, Damanhour	300
7° Construction office and stores Inspection, Damanhour,	125
8° Repairs Police Barracks, Rosetta	320

A complete list of the Government buildings in Alexandria and the Behera Province was completed in 1904. It includes:—

1. Buildings.
2. Buildings occupied and under Tanzim.
3. Buildings occupied under control of occupying service who pay for repairs.

Certain Departments, such as the Quarantine board and the Ports and Lights, have caused much confusion in our service by themselves effecting constructive changes in the buildings of No. 2 category without reference to the Public Works Department. The question

of responsibility for repairs becomes in such cases extremely complicated, necessitating special registers and much useless correspondence.

Several large projects have been studied by the West Inspection in 1904, such as:—

1. Stables and Police barracks, Alexandria.
2. Government Offices on the new Quay.

The latter project was considerably modified at the request of the Finance and Interior. The building will contain: Ground floor, Governorat and Police. 1st floor, Ministers, summer offices and Tanzim and Irrigation. 2nd floor, Contentieux.

3. Annexe Damanhour School.
4. New School, Rosetta.
5. Damanhour Merkaz.
6. Annexe Parcels Post.
7. Barracks for English and Egyptian troops.

The above designs necessitated the preparation of 178 plans.

New Work.—The foundation of the Minet-el-Bassal Tribunal was exceptionally bad, consisting, as it did, of old cisterns and catacombs. Some of these were only discovered after repeated flood testing and the collapse of the superincumbent earth. The concrete could not be placed till after three months of excavation and water testing. Owing to the extreme care taken no cracks with the foundations appeared in the building.

Repairs.—The repairing of the roofs, balconies and cornices of Rus-el-Tin palace was continued in 1904, and completed in spite of delay and bad work on the part of the European contractor.

Quarantine Park, Mer.—The béton armé roof of these buildings showed, on inspection early in 1904, signs of severe deterioration.

A Commission composed of Messrs. Pastour, Ehrlich and the agent of the Inventor Hennebique was appointed to report.

A copy is attached. (Vide Annexe A).

I will briefly summarize.

The work was completed in 1897 by the contractor Marciano. The system employed is known as Hennebique armoured concrete.

The process being a patent, complete liberty was left to the contractor and Hennebique as regards the ingredients of the concrete, manner of

mixing, timbering and general manipulation. Mr. Hennebique frequently asked us to interfere as little as possible. This fact is material in connection with the final denouement.

The Patentor had always declared that the metal skeleton could not be reached by moisture and consequently oxidised in virtue of the fact that the "lait du ciment" or cement milk contained in the concrete adhered to, and entirely protected, the imbedded iron or steel.

It may be said that the very existence of all systems of armoured concrete depends entirely on the truth or otherwise of this fundamental proposition.

If moisture can reach and corrode the metal framework the whole system is worthless.

At Mex moisture did reach and did corrode the "armour" of the Main concrete joists. The whole roof is therefore in danger of collapse.

On our throwing the blame on the Inventor, the latter disclaimed all responsibility, which he declares falls on the contractor.

The matter is now before the Court.

The reasons for the failure of his system are ascribed by M. Hennebique to the hygrometric quality of the Mex stone, to the use of sea sand and to the penetrating action of storm-driven rain. The building is on the sea-shore.

These arguments seem to me beside the mark. The system is recommended for piles under water, for bridges, dams and works in salt and fresh water. The conditions at Mex cannot be worse than those obtaining in any of the above cases.

I am personally of opinion that armoured concrete can safely be used in Cairo, more especially if, as in the case of the Museum, it is protected by a bituminous coat.

Mr. Ehrlich, in addition to his other work, reported on,

- (1) The raising of the Quay Wall.
- (2) The Alexandria fortifications.
- (3) Fire protection and regulations, Alexandria theatres.
- (4) Maintenance of the East Harbour Quay.
- (5) Construction of the Main sewerage.
- (6) Delimitation of the city.
- (7) Breakwater extension.

He further proceeded to Snakin, and reported on the choice of a new Harbour at Shekh-el-Barghut.

ANNEXE A.

PARCS QUARANTENAIRES DU MEX.

Procès-Verbal de constatation de l'état des toitures.

Le 6 avril 1904 les soussignés :

F. EHRLICH, Inspecteur de l'Ouest,

P. COUSIN PASTOUR, Inspecteur des Bâtiments Spéciaux du Nord,

E. SERVIS, Ingénieur Agent des Ciments Armés, système Hennebique,

accompagnés de M. STACET, assistant, comme ingénieur de la maison PATOVA R. ROTIS & Co., se sont transportés aux parcs quaranténaires du Mex. à l'effet de rechercher et déterminer les causes des détériorations survenues aux toitures en ciment armé, système Hennebique, des hangars à bestiaux et, en suite de cet examen, les soussignés ont établi ce qui suit :

ÉTAT DES CONSTRUCTIONS.

Les parcs quaranténaires du Mex ont été construits par M. Nicolas Marciano, alors concessionnaire des ciments armés du système Hennebique en Egypte, par contrat en date du juillet 1897 avec une garantie de trois années, réduite plus tard à deux années à la suite d'une convention spéciale.

Les travaux furent commencés au mois de septembre 1897.

La réception provisoire des travaux eut lieu à leur achèvement, le 26 mai 1899, et enfin la réception définitive fut effectuée deux ans après, c'est-à-dire, le 20 avril 1901.

Les hangars entièrement en ciment armé sont établis sur des colonnes reposant sur un plateau de fondation, supportant les toitures en hourdis sur poutres, le tout conforme aux dessins d'exécution.

Le béton du plateau de fondation des colonnes et les colonnes elles-mêmes, est formé de tuileaux et mortier de ciment.

Le hourdis et la poutraison des toitures sont formés de pierraille du Mex et mortier de ciment.

Au début, ces toitures n'étaient recouvertes d'aucune matière étanche, et ce n'est que plus tard, par suite de la filtration des eaux pluviales à travers diverses parties de ces toitures, que quelques unes de celles-ci furent au fur et à mesure des crédits disponibles revêtues d'une chape en asphalte assurant leur étanchéité.

Tous les hangars sans exception présentent actuellement plus ou moins et à divers degrés les particularités suivantes :

De larges boursofflures semblables à celles qui résultent du fait de l'existence d'inuits de eaux dans les enduits, se manifestent au droit des étriers des poutres

tres et en de nombreux endroits ces boursoufflures ayant atteint la limite extrême de leur position, ont amené la chute de larges plaques de béton des faces extérieures des poutres, mettant à nu les étriers et les barres de l'armature. Ailleurs, des poutres sont fendues longitudinalement sur leur face inférieure, séparant ainsi la poutre en deux parties.

Les colonnes sont intactes, le hourdis également.

Les étriers mis à nu par la chute des plaques de béton qui les recouvraient, apparaissent non seulement fortement rouillés, mais généralement la rouille a entièrement détruit le fer dans la région moyenne de la hauteur de l'étrier, ailleurs sur toute la longueur de ce dernier.

Les barres de l'armature, offrant à l'attaque de la rouille un bien plus grand volume de métal, ne sont encore que légèrement attaquées par la rouille, dont l'action destructive est plus lente par le fait du surplus de résistance offert par les barres.

Après ces constatations, nous avons voulu nous rendre compte de l'état des fers de l'armature et des étriers dans les poutres paraissant encore en bon état, et dans ce but nous avons fait effectuer des sondages dans diverses poutres au droit des étriers. Partout les fers de ces derniers surtout nous sont apparus avec un commencement de rouille.

Nous avons également fait des sondages dans les colonnes, dont le béton est fait avec du chakf, et ici le fer est demeuré en parfait état de conservation. Un sondage également pratiqué dans les murs formés de plaques de ciment armé, nous a permis de voir les fers en bon état.

CAUSES DES DÉTÉRIORATIONS.

En suite des constatations précédentes nous avons recherché les causes qui ont pu provoquer les détériorations survenues et qui mettent évidemment les toitures de ces hangars en très dangereuse situation, en raison de l'affaiblissement considérable des poutres qui les supportent, affaiblissement résultant de la chute du béton de leurs faces et de la destruction des étriers qui sont l'élément principal de leur résistance aux charges à supporter (voir photographies I, II, III et IV prises dans le hangar A et B dont l'état de détérioration est le plus marqué).

A notre avis les causes de ce que nous pouvons appeler un désastre, proviennent de l'emploi de la *pierraille du Mex* dans la confection du béton des poutres et du hourdis, et ce fait nous paraît d'autant plus certain que la destruction du fer des étriers par la rouille qui l'a rongé n'est survenue que dans les parties où cette pierraille a été employée pour la confection du béton.

Il faut en effet remarquer que le béton lui-même ne laisse rien à désirer au point de vue de la qualité, et qu'il a été très bien exécuté, bien mélangé ainsi qu'en font preuve les échantillons ci-joints pris au hasard dans divers hangars. Mais si le béton, exécuté avec cette pierraille du Mex, a donné un bon résultat en tant que béton seul, il a été une grande faute d'employer cette pierraille pour le béton armé.

En effet, cette pierraille est un calcaire tendre, le sable d'Alexandrie est beaucoup plus calcaire que siliceux, par suite de la présence de petits fragments de coquillages, et, par suite, ces calcaires, joints à celui contenu dans le ciment, finissent par leur amalgame intime, par modifier les propriétés particulières du

ciment. Cet effet est encore accru par le pilonnage, lequel, exécuté d'une façon plus ou moins vigoureuse, réduit en poudre la pierre calcaire du Mex. et place en contact direct ce calcaire avec le fer des étriers. Or, il est connu que le fer ne se conserve pas dans le calcaire, mais au contact de celui-ci il est vivement attaqué par la rouille.

Ici encore, les étriers par leur nature (fer fenillard) et leur position dans les pontres, présentent évidemment plus de surface à l'attaque des carbonates de chaux, tandis que les barres de l'armature, épaisses et rondes, sont en meilleure condition pour résister à ces atteintes. Le pilonnage un peu excessif du béton, en comprimant plus que de raison la pierreaille trop tendre du Mex. a produit à notre avis une poussière impalpable de calcaire, qui en se mélangeant intimement avec le ciment au moment de sa prise, a détruit les qualités protectrices de celui-ci pour le fer, qualités essentielles et base du ciment armé.

Les fenillards qui ont séjourné un certain temps sur le chantier et qui ont été déjà atteints par la rouille, ne trouvant pas dans le mortier de ciment, modifié par l'addition du calcaire, la protection chimique qu'on lui connaît, ont continué à s'altérer par la pénétration de l'air, dont le ciment ne pouvait plus empêcher l'accès.

La rouille a pu ainsi librement effectuer son action destructive, et cette action se traduisant en une augmentation de volume a provoqué de légères fissures. Celles-ci en permettant alors un accès facile à l'air salin de la mer ont favorisé l'extension des ravages de la rouille, et le manque d'enduit des faces, joints aux eaux de pluie, qui ont traversé les pontres en de nombreuses occasions, les vents violents auxquels sont exposés ces hangars, toutes ces causes unies, plaçant ce béton dans une situation de perméabilité très grande, ont causé les ravages que nous avons constatés, et dont les photographies ci-annexées donnent une juste idée.

Il y a lieu également de faire examiner par des chimistes, si les gaz produits par le séjour du bétail et de leurs excréments, n'a pas été également une cause importante de cette corrosion du fer.

CONCLUSIONS

En l'état ces toitures doivent:

1° Être étayées partout où l'état des pontres le nécessite, afin de parer à toute éventualité, et cela d'urgence.

2° Un projet doit être demandé à la Maison Hennebique pour la démolition et reconstruction de ces hangars dont l'état actuel et les ravages qui s'étendent journellement, ne peuvent qu'amener tôt ou tard une catastrophe.

3° Rechercher et établir les responsabilités après accord avec le Contentieux de l'Etat, la responsabilité décevante de l'entreprise étant ici évidente.

Alexandrie, le 7 avril 1901.

Signer: F. EHRLICH.
" COSIN PASTOUR.
" SERVIN EMILE.

APPENDIX.

WEST INSPECTION.

The amount of L.E. 217,985, representing the cost of the construction of Ras-el-Tin Palace, is very approximate. It has been arrived at by estimating the value of the different blocks which compose it, viz:—

	Surface.	Cost by M ²		Total.
	M ²	L.E.	M.	L.E. M.
Block of H.H. the Khedive and H.H. the Khediva Mother (richly decorated)	4,700	25	—	117 500
Block for the retinue of the Khedivial family and blocks for the Palace officials, without ornamentation	7,251	7	500	54 375
Kitchens, Khedivial Guards and annexes (ordinary barracks)	15,370	3	—	46 110
Total	27,321			217 985

WEST INSPECTION.

List giving the demolitions ordered, executed and not executed in 1904.

Name of Town.	Demolitions ordered.	Executed.	Not executed.
Damanhour	22	19	3
Rosette	5	5	—
Grand total ...	27	24	3

Table showing towns under Tanzim regulations, towns which have municipal or local councils, and number of inhabitants.

No.	Under Tanzim Regulations.	Municipal or local councils.	Number of Inhabitants.
1	Damanhour... ..	Damanhour	32,122
2	Rosette... ..	—	14,286

Tanzim Rokhsa delivered in 1904.

Years.	Towns.	For Buildings and Repairs.	For Occupation of the Public way.	For Verandahs and trottoirs.	Totals.	Receipts.
						L. R. M.
1904...	Damanhour	309	65	33	407	148 420
1904...	Rosette	114	—	5	119	40 840

ANNEXE A.

Tableau indiquant le travail rendu par l'Ingénieur du Tanzim de Damanhour en 1904.

Tableau indiquant le travail rendu par 1000														
Régions				Droits					Frais-verbaux de réajustement.					
Constructions.	Régulations.	Troisième.	Ventilates.	Constructions.	Régulations.	Troisième.	Ventilates.	Total.	Frais-verbaux de réajustement.	Arrêtés de démolition.	Zialet Tazim.	Terrain pris pour le Tazim.	Plats machines vides.	Loyers pour étiers.
106	101	14	19	62.620	23.650	2.800	3.800	92.870	4.	46	553.37	64.52	27	27
201	108	14	19	62.620	23.650	2.800	3.800	92.870	4.	46	553.37	64.52	27	27

ANNEXE B.

Tableau indiquant le travail rendu par l'Ingénieur du Tanzim de Rosette en 1904.

Rakhsas	Droits					Frais-verbaux de réajustement.	Frais-verbaux de contribution.	Arrêtés de démolition.	Zialet Tazim.	Terrain pris pour le Tazim.	Plats machines vides.	Loyers pour étiers.	
	Constructions.	Régulations.	Troisième.	Régulations.	Total.								
101	108	14	19	62.620	23.650	2.800	3.800	92.870	4.	92.870	31	23	553.37
201	108	14	19	62.620	23.650	2.800	3.800	92.870	4.	92.870	31	23	553.37

Expropriation and Sale of Ziadet Tanzim.

Years.	Towns.	EXPROPRIATIONS			ZIADETS SOLD		
		Area.	Sums paid.	Rate of M ²	Area.	Sums received.	Rate of M ²
1904...	Damanhour...	50.63 ¹	10.760	0.212	369.88	191.900	0.519
1904...	Rosette... ..	36.22	5.044	0.139	464.98 ²	18.159	0.039

¹ Outre une superficie de 14.34 non estimée jusqu'à présent.

² Outre une superficie de 260.84 non estimée jusqu'à ce jour.

APPENDIX N° 1.

Comparaison entre les différents prix de revient par mètre cube de Solivage pour Toitures.

CALCULS POUR UNE SURFACE DE 29 MÈTRES CARRÉS.

A. — Poutrelles et hourdis au machefer au mortier de 1 partie de ciment et sable et 3 parties de machefer. Poutrelles espacées 0.70 d'axe en axe de $\frac{100 + 80}{8}$ pesant Kg. 23 le mètre linéaire.

				L.E. M.
1. — Poutrelles 7 × 6.50 × 23 Kg. Kg.	1046.5	00.10	10 465	
2. — Hourdis au machefer M ³	4.640	0.800	3 712	
3. — Béton ordinaire de 0.10 m et chape ... M ³	29	0.067	1 943	
4. — Enduit au plâtre »	29	0.035	1 015	
5. — Asphalte naturel »	29	0.130	3 770	
6. — Frais d'échaffaudage, étais, plancher etc. »	29	0.040	1 160	
			22 065	
Majoration 6 %			1 324	
A. Total			23 389	

Soit pour une surface de 1 M², L.E. 0 806 ^m.

B. — Poutrelles et solives recouvertes avec des bougladli.

				L.E. M.
1. — Poutrelles (comme D')	582	0.010	5 820	
2. — Solives nouvelles dressées M ³	1.540	3.200	4 928	
3. — Planches rainées M ³	29	0.032	2 668	
4. — Nattes »	29	0.015	0 451	
5. — Couche de terre »	29	0.005	0 145	
6. — Béton ordinaire de 0.10 m et chape ... »	29	0.067	1 943	
7. — Bougladli et enduit »	29	0.110	3 190	
8. — Asphalte »	29	0.130	3 770	
Total			22 899	
Majoration 6 %			1 374	
B. Total			24 273	

Soit pour une surface de 1 M² L.E. 0 837 ^m.

EXAMPLES OF THE DIFFERENT SYSTEMS OF FLOORING

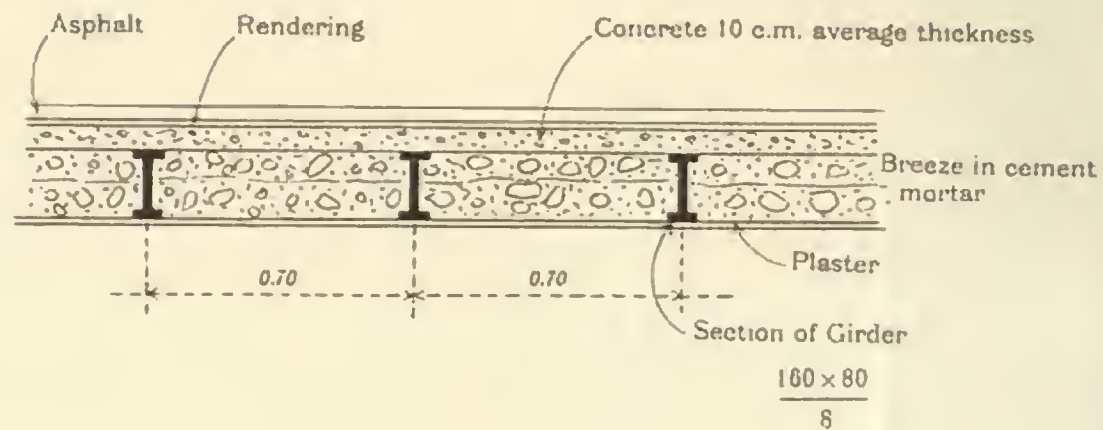
SEE PAGE 226.

WITH GIRDERS, AND JOISTS

Scale 0.02 m. = 1.00 m.

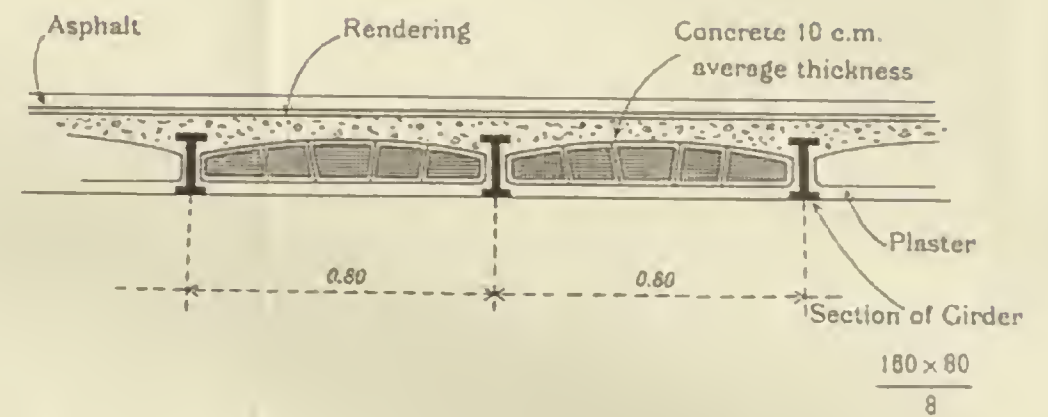
GIRDERS FILLED IN WITH BREEZE CONCRETE

A



GIRDERS WITH TUBULAR BRICKS

C

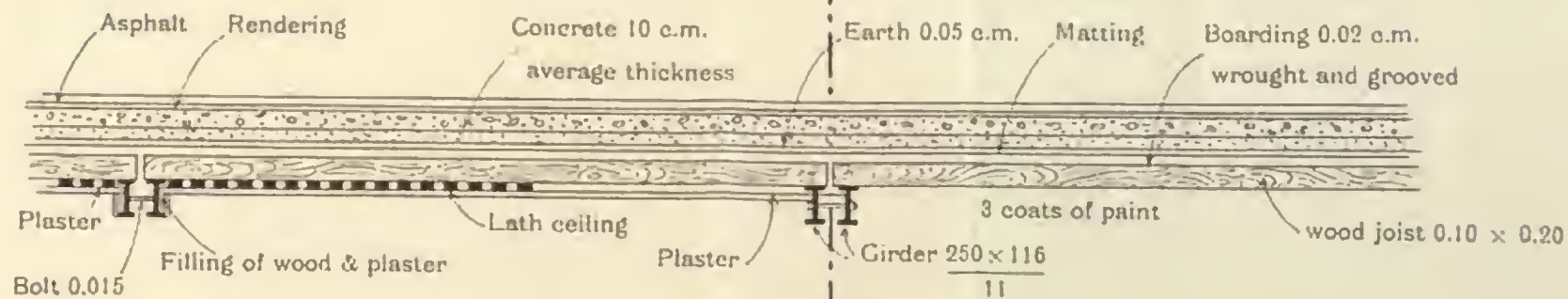


GIRDERS AND JOISTS WITH LATH CEILING

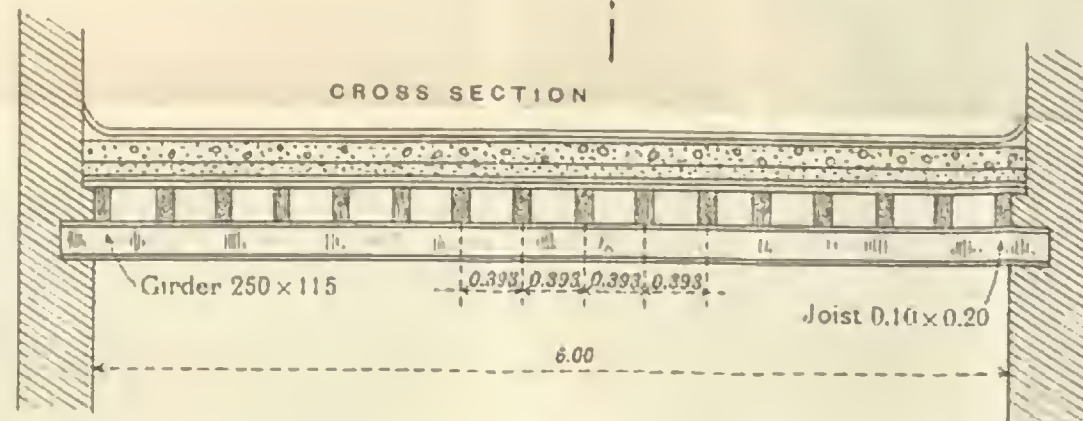
GIRDERS AND JOISTS WITHOUT CEILING

B

D

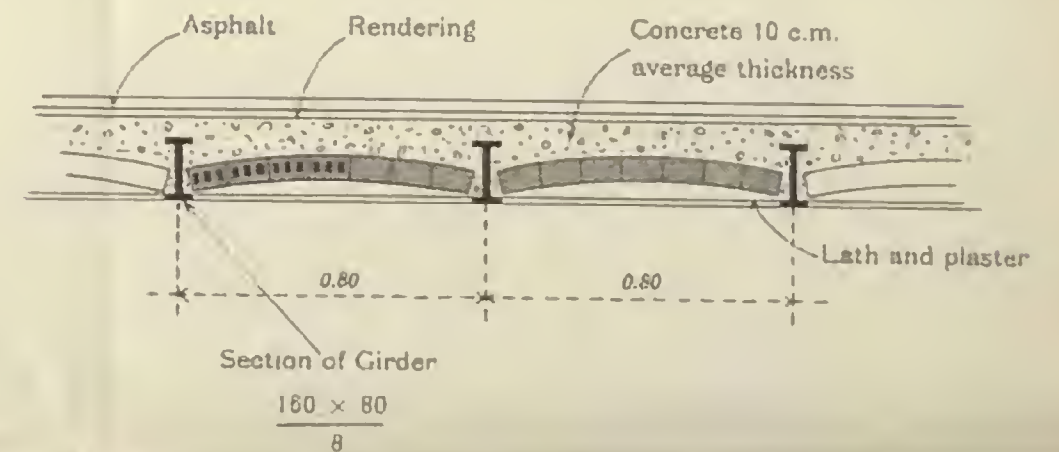


CROSS SECTION



GIRDERS WITH HOLLOW BRICKS

E





C. — Poutrelles et briques à plancher tubulaire. Poutrelles espacées de 0.80 d'axe en axe de $\frac{160 \times 80}{8}$ pesant Kg. 23 le mètre linéaire.

				L.E. M.
1. — Poutrelles 6 × 6.50 × 23 Kg....	Kg.	897	0.010	8 970
2. — Briques à plancher, tubulaires ...	M ²	29	0.250	7 250
3. — Béton ordinaire de 0.10 ^c _m et chape ...	»	29	0.067	1 943
4. — Enduit au plâtre ...	»	29	0.035	1 015
5. — Asphalte naturel ...	»	29	0.130	3 770
Total...				22 948
Majoration 6 %...				1 325
C. Total...				24 325

Soit pour une surface de 1 M² L.E. 0 839 ^m_m.

D. — Poutrelles et solives apparentes.

				L.E. M.
1. — Poutrelles de 0.250 de profil 2 × 6.50 × 45 Kg. ...	Kg.	582	0.010	5 820
2. — Solives de Caramanite dressées 16 × 4.80 × 0.10 × 0.20 ...	M ²	4.54	4.540	6 990
3. — Planches pour faux planches de 2 ^c _m dressées et rainées 4.81 × 6.00 ...	M ²	29	0.102	2 958
4. — Nattes 4.81 × 6.00 ...	»	29	0.115	0 435
5. — Couche de terre 4.81 × 6.00 ...	»	29	0.005	0 145
6. — Béton ordinaire de 0.10 ^c _m et chape 4.81 × 6.00 ...	»	29	0.067	1 943
7. — Asphalte naturel 4.81 × 6.00 ...	»	29	0.130	3 770
8. — Peinture à l'huile 3 couches ...	»	58	0.032	1 856
Total...				23 917
Majoration 6 %...				1 435
D. Total net...				25 352

Soit pour une surface de 1 M² L.E. 0 874 ^m_m.

E. — Poutrelles et hourdis en briques à 3 trous. Poutrelles espacées de 0.80 d'axe en axe et du profil $\frac{160 \times 80}{8}$ pesant Kg. 23 le m. linéaire.

				L.E. M.
1. — Poutrelles 6 × 6.50 × 23 Kg. ...	Kg.	897	0.010	8 970
2. — Voutins en briques à 3 trous ...	M ²	29	0.195	5 655
3. — Enduit avec demi chevron et bougdadli. ...	»	29	0.130	3 770
4. — Béton ordinaire de 0.10 ^c _m et chape ...	»	29	0.067	1 943
5. — Asphalte naturel ...	»	29	0.130	3 770
Total...				24 408
Majoration 6 %...				1 446
E. Total net...				25 554

Soit pour une surface de 1 M² L.E. 0 881 ^m_m.

APPENDIX N° 4.

Note sur la détérioration des toitures des hangars à bestiaux à Mex.

Dans le désir de rechercher les causes qui ont amené la détérioration des toitures des hangars à bestiaux à Mex. je m'étais dit dès le début qu'une des grandes causes de la ruine de ces toitures devait être leur non étanchéité.

Ensuite, après que la Commission s'est réunie à Mex. elle a établi d'une façon bien concluante il me semble, certaines causes très importantes, qui ont dû provoquer les ravages apparents dans le béton et le fer, et il ne peut y avoir plus de doute à mon avis, que l'emploi de la pierre calcaire, que nous avons citée comme l'ennemi le plus puissant du conglomeré et surtout du fer, a été pour beaucoup dans la destruction de l'ensemble.

Aussi dans notre rapport, nous avons parlé de la perméabilité du béton, et en effet, l'expérience nous apprend qu'il est presque impossible de produire un béton, même aussi soigneusement mélangé que possible, qui soit tout à fait imperméable ou étanche contre l'accès de l'air aussi bien que de l'eau.

Il est certain encore, que le calcaire non siliceux du Mex. qui prédominait dans la composition comme nous l'avons dit dans le rapport, a fini par adultérer et par remplacer en partie le ciment qui était le principal garant de l'imperméabilité.

Encore savons-nous combien il était important dans un endroit si exceptionnellement exposé aux intempéries, d'être soigneux dans la composition des matériaux, dans le dosage et dans l'exécution même du béton. En effet, je crois que dans toute l'Égypte, le Parc Quarantenaire du Mex est le seul endroit où l'on ait élevé des hangars ouverts, entièrement faits en béton armé, à une distance de 20 mètres du bord de la mer.

Il fallait donc exécuter le béton dans les meilleures conditions possibles.

Nous savons déjà par les analyses des morceaux de conglomerés soumis avec le rapport, pouvant nous renseigner plus largement à ce sujet, que ces conditions n'étaient pas remplies.

Mais avons-nous considéré le cas sous tous les points de vue qui nous intéressent dans notre recherche ?

Parmi les conditions assurant la résistance et la durée d'une toiture en béton armé, avons-nous suffisamment insisté sur la protection de la toiture pour la rendre imperméable ?

Avons-nous prouvé, que, protégé ou non, ce béton, par le seul fait qu'il était largement composé de calcaire du Mex. était condamné à la ruine tôt ou tard ?

Ou, en d'autres mots :

Avons-nous prouvé qu'en le protégeant par en haut et par en bas, l'ensemble de l'armature aurait quand même succombé aux influences atmosphériques et à l'action destructrice du calcaire sur le fer ?

Je pense qu'à toutes ces questions nous devons répondre : NON.

On pourrait objecter ici :

Mais les colonnes, qui n'étaient pas protégées non plus, pourquoi sont-elles restées intactes ?

Sans doute la présence du chakf dans le béton, ainsi que nous l'avons signalé dans le rapport, était une garantie assurant d'abord une meilleure qualité de béton moins absorbant et en conséquence plus imperméable, et une garantie encore contre une corrosion trop rapide du fer.

Mais ceci ne peut pas être la seule cause de leur conservation en bon état.

Les colonnes, d'abord par leur position même, ne sont pas les premières à recevoir l'attaque des pluies, elles sont protégées par la toiture jusqu'à un certain degré. Ensuite elles travaillent dans toutes leurs parties constructives en compression et non en traction. Les fers feuillards (étriers) qui sont les premiers à se détériorer par l'effet de la corrosion, y manquent entièrement. Et enfin le placement même des barres en fer dans le sens vertical assure mieux leur enveloppement entier par le béton et le ciment, car ils sont accessibles de tous les côtés pendant l'exécution du pilonnage, ce que ne sont pas les barres horizontales des pontres. Ainsi une adhérence plus parfaite du ciment protecteur au fer est assurée.

Or, qu'est ce que nous entendons par protection du béton par en haut et par en bas ?

La protection par en haut aurait dû être une chape en asphalte naturel ou de la « piccoline », ainsi qu'ailleurs il s'exécute dans tous les travaux neufs en béton armé dès le début. N'ayant pas l'expérience de la piccoline, qui n'a jamais été essayée encore dans les travaux d'Alexandrie, je donnerais la préférence à l'asphalte. Celui-ci exécuté en deux couches aurait à mon avis, formé une couverture imperméable autant qu'on peut l'obtenir dans ce pays-ci.

Par en bas, un enduit de mortier de ciment dans la proportion de 1 : 1, par exemple, aurait eu un excellent effet, appliqué sur toute la face inférieure du hourdis et enveloppant également les trois faces des pontres. En appliquant là-dessus encore un bain de ciment liquide pur, je erois que le béton armé des hangars à Mex, ainsi protégé, aurait résisté plus longtemps qu'il ne l'a fait en réalité.

Si on a vu, comme j'ai eu l'occasion pendant quatre hivers consécutifs, les pluies quelquefois torrentielles de l'hiver passer en grands paquets d'eau le long des centres des solives et également, quoique en quantité moindre, à travers les hourdis reliant la pontraison, si on a vu ces fentes empiétant et s'agrandissant avec le temps, si enfin on s'imagine que cet effet des intempéries a pu continuer son travail dévastateur, en amenant l'humidité et donnant accès à l'air salé de la mer à l'intérieur de la toiture pendant presque quatre années⁽¹⁾, alors on commence à croire que, non seulement l'application d'une protection dans le sens décrit ci-haut, était de la plus grande nécessité, surtout dans un endroit aussi fortement exposé qu'est le Parc Quarantenaire du Mex, mais plus encore :

Qu'avec cette protection appliquée dès le début, nous ne nous trouverions peut-être pas en ce moment-ci vis-à-vis d'un fait, qui dans le rapport a été justement appelé un désastre.

Je joins à cette note un bref extrait des traités divers sur béton armé, que j'ai déconvertis pendant les dernières années, dans différents journaux techniques distribués par notre Ministère. Ces notes, il me semble, sont d'un intérêt général. Je n'y ai porté que ce qui se réfère au sujet traité dans ma note précédente.

Alexandrie, le 20 avril, 1905.

Signé : F. EHRLICH

(1) En été 1898 la moitié des hangars était achevée, seulement en été 1902, j'ai pu trouver les fonds nécessaires pour couvrir 50% des toitures en asphalte.

APPENDIX N° 5.

A — Poids des divers matériaux de construction mortier et maçonnerie.

N°	DÉSIGNATION	Poids en Kg.
MATERIAUX		
1	Sable du rivage de la mer le M ³	1.290
2	Chaux vive du Mex »	1.230
3	Chaux éteinte du Mex non criblée »	650
4	Chaux éteinte du Mex criblée »	590
5	Briques du pays (compris les vides entre briques) »	1.430
6	Briques du pays en bloc »	1.565
7	Moellons du Mex (compris les vides) »	1.250
8	Moellons du Mex en bloc »	2.250
9	Ciment Valentine (12 barils) »	1.800
10	Ciment Portland (12 barils) »	1.920
11	Chaux du Theil »	685
12	Caillasse de moellons du Mex »	1.300
13	Plâtre gris de Chypre... .. »	1.000
MORTIER		
1	Mortier à sec composé d'une partie de chaux et de deux parties de sable »	1.180
2	Le même gâché à l'eau »	1.800
3	Mortier à sec composé de deux parties chaux et sable »	1.140
4	Le même gâché à l'eau »	1.775
5	Mortier à sec composé d'une partie de chaux hydraulique du Theil et de deux parties de sable... .. »	1.375
6	Le même gâché à l'eau »	1.856
MAÇONNERIE		
1	Maçonnerie fraîche en moellons du Mex hourdée au mortier d'une partie chaux du pays et deux parties sable. »	1.950
2	La même après 15 jours »	1.760
3	Maçonnerie fraîche en briques du pays hourdée au mortier de deux parties de chaux du pays et trois parties de sable »	1.730
4	La même après 15 jours »	1.500
BÉTON		
1	Béton composé de 1 mortier et 2 de caillasse dont le mortier est composé de 1 de chaux du Theil et 2 de sable... .. »	2.100
2	Ancien béton après 10 jours »	1.950
3	Béton composé de 1 mortier et 2 caillasses dont le mortier est composé d'une partie de chaux du pays, une partie de pouzzolane et une de sable »	2.000
4	Le même après 10 jours »	1.850

B. — Diminution de poids de la maçonnerie observée pendant 15 jours.

N°	Maçonnerie en briques Poids d'un Mètre Cube en Kg.	DATE	Maçonnerie en moellons Poids d'un Mètre Cube en Kg.
1	1.730	21 Mars 1904	1.850
2	1.712	22 » »	1.820
3	1.685	23 » »	1.800
4	1.655	24 » »	1.790
5	1.630	25 » »	1.780
6	1.600	26 » »	1.770
7	1.580	27 » »	1.762
8	1.560	28 » »	1.751
9	1.540	29 » »	1.746
10	1.525	30 » »	1.739
11	1.510	31 » »	1.733
12	1.506	1 ^{er} Avril »	1.730
13	1.503	2 » »	1.730
14	1.500	3 » »	1.730
15	1.500	4 » »	1.730

Diminution de poids.

Pour maçonnerie de briques environ 13,3 %.

» » de moellons » 6,5 %.

Aucune diminution de poids ne pouvant être observée sur nos balances après le 3 avril pour le cube des briques et après le 1^{er} avril pour les moellons du Mex, on a considéré que toute l'eau contenue dans les mortiers s'était évaporée et que par suite la maçonnerie étant sèche avait gagné son équilibre et un poids stable.

Les observations n'ont donc pas été continuées après cette date.

Les essais ont été faits sur des cubes de maçonnerie de $0,50 \times 0,50 \times 0,50$ c'est-à-dire $\frac{1}{8}$ d'un mètre cube.

CAIRO-DELTA INSPECTION

Table showing total number of buildings repaired and expenditure on same.

Inspection.	Total number of buildings repaired.	TOTAL SPENT ON	
		Ordinary Budget.	Special Credit.
		L. E.	L. E.
CAIRO-DELTA.			
Cairo	14	—	13,790
Delta	44	5,685	—
Delta	20	530	...
Total ...	78	6,215	13,790
Grand Total...		20,005	

List showing revenues of Tanzim Offices in 1904.

Name of Town.	Sale of Buildings Rohsa.	Permits for Temporary Occupation of roads.	Permits for Permanent Occupation of roads (pique).	Sum Total for each town.	
	L. E.	L. E.	L. E.	L. E.	M.
Tanta	14,910	1,011,893	14,485	1,011	288
Kufr-el-Zayat	25,450	90,125	3,250	118	835
Mehalla-el-Kobra ...	16,800	150,919	2,020	169	739
Talkha	0,180	—	—	0	180
Samantud	1,650	—	—	1	650
Zifta	4,590	15,540	0,700	20	830
Chibin-el-Kom	8,010	46,220	0,360	54	590
Kuesna	0,360	—	—	0	360
Menuf	5,340	21,875	1,750	28	965
Grand Total... L. E.				1,436	437

Tanzim Rokhsas delivered in 1904.

Towns.	Years.	for Buildings and repairs.	For occupation of the public way	For verandahs.	Totals.	Receipts.	Remarks.
Tantah	1902 ...	310	718	44	1079	603,402	
	1903 ...	391	786	20	1197	923,264	
	1904 ...	442	979	21	1442	1,171,818	
Kafr-el-Zayat	1902 ...	66	434	3	200	107,692	
	1903 ...	99	143	4	246	115,450	
	1904 ...	88	134	4	226	116,675	
Mehalla-el-Kobra	1902 ...	282	244	—	526	171,740	
	1903 ...	327	204	—	531	218,870	
	1904 ...	567	249	2	818	327,600	
Zifta	1902 ...	117	46	8	171	83,114	
	1903 ...	123	79	10	212	87,690	
	1904 ...	144	81	6	231	100,260	
Sannoud... ..	1904 ...	55	—	1	56	14,620	
Talkha	1904 ...	4	—	—	4	4,200	
	1902 ...	176	52	22	250	72,840	
Chibin-el-Kom	1903 ...	253	83	28	364	117,960	
	1904 ...	250	81	37	371	111,520	
Konosna	1904 ...	8	—	3	11	3,160	
Menouf	1902 ...	151	32	2	185	60,795	
	1903 ...	236	64	4	304	108,155	
	1904 ...	177	59	—	216	68,565	

Expropriation and Sale of Ziadet Tanzim.

Years.	Towns.	EXPROPRIATIONS.			ZIADETS SOLD.			Remarks
		Area.	Sum paid.	Rate of M ²	Area.	Sum received.	Rate of M ²	
			L.E. M.			L.E. M.		
1904	Tanta...	169.06	40 949	0.242	174.042	241 626	1.388	
1904	Kafr-el-Zayat...	—	—	—	—	—	—	
1904	Mehalla...	90.07	72 569	0.805	434.502	128 720	0.296	
1904	Sammoud...	—	—	—	32.47	9 240	0.284	
1904	Zifta...	—	—	—	62.89	13 994	0.222	
1904	Chihine...	392.00	436 269	0.347	26.48	12 260	0.463	
1904	Menouf...	10.12	6 107	0.603	155.73	43 045	0.276	

Table showing Towns under Tanzim regulations
Towns which have municipal or local councils and number of inhabitants.

Nos.	Under Taxim regulations.	Municipal or local.	Number of inhabitants.
	<i>Delta.</i>		
1	Tintah	Commission ...	51,289
2	Kafr-el-Zaynt	" ...	9,854
3	Mehallah el-Kebir	" ...	31,100
4	Ziftah	" ...	15,721
5	Chebine el-Kom	" ...	20,512
6	Menoof	" ...	19,726
7	Samanood	No Commission	12,608
8	Tulkha	"	6,430
9	Kouesna	"	3,147

List of works, Repairs, etc. executed in 1904.

%	Locality.	Number of workers.	From L.E. 1,000 to L.E. 10,000	From L.E. 10,000 to L.E. 100,000	From L.E. 100,000 to L.E. 200,000	From L.E. 200,000 to L.E. 1,000,000	From L.E. 1,000,000 to L.E., etc.	Total
	CAIRO-DELTA.							
1	Cairo... ..	370	1,102	2,297	1,790	9,500	4,780	
	Delta... ..	461	1,102	2,297	1,790	9,500	4,780	
	Cairo Total L.E.	—	—	—	—	—	—	19,475
2	Delta... ..	28	109	421	—	—	—	
	Delta Total L.E.	—	—	—	—	—	—	530
	Grand Total ... L.E.							20,005

List of works executed in 1904. Sanitary works.

No.	Ministry	Subject.	Total
			L. L.
		<i>Cairo.</i>	
1	Public Works D. ...	Construction Septic tank at Cairo Tanzim Office	125
2	Finance	Sanitary Work at Central Post Office.	40
3	"	Construction of percolating pit and Septic tank at Post Office	102
4	Interior... ..	Sanitary Work at Shoobra Karacol...	125
5	"	Sanitary Work at the Ministry of Interior	30
6	"	Sanitary Work at Boulac Police School	130
7	Public Instruction ...	Construction of W. C's at Khedivial School	180
8	" ...	Construction of Lavatory at Khedi- vial School	60
9	" ...	Drainage at Abbas School	16
10	" ...	Filling in old drains at the School of Medicine	24
11	" ...	Sanitary Work at Abd el-Aziz School (Old School of Law)	230
12	" ...	Sanitary Work at Old Khedivial Library	120
13	" ...	Sanitary Work at Tewlikieh School...	20
14	Justice	Sanitary Works at the Ministry of Justice	22
		Total	1,224

List of works executed for different departments in 1904.

№	Departments.	Locality.	Number of works.	Amount Total.
				L. E.
	CAIRO-DELTA.			
	Cairo.			
1	Public Works	Ministry	215	2,806
	"	Opera... ..	41	410
	"	Cairo Tanzim Office	2	910
	"	Esbekieh Theatre	1	95
	"	Khed. Geographical Society	5	180
	"	Quay of Kasr el-Dolara	3	49
	"	Ibrahim Pacha's Statue	1	115
	"	Institut Egyptien	2	12
	"	Restaurant Santi	1	7
	"	Fencing School	1	8
2	Finance	Ministry	5	2,067
	"	Printing Office	2	107
	"	Public Debt... ..	2	49
	"	Post Office	18	850
	"	Citadel Archives... ..	1	2,100
3	Interior... ..	Ministry	9	1,068
	"	Governorat	18	1,189
	"	Boulaq Police Stores... ..	4	745
	"	Shoolbra Karacol... ..	2	250
	"	Khalifa Karacol... ..	3	186
	"	Fire Station... ..	1	60
	"	Boulaq Karacol	1	4
	"	Old-Cairo Karacol	1	10
	"	Gamalieli Karacol	2	3
	"	Police Married Quarters	1	240
4	Public Instruction	Ministry	5	64
	"	Old Khedivial Library	2	550
	"	School of Medicine	5	468
	"	Khedivial School	19	792
	"	Mohadayan School	9	61
	"	Abbas School	6	68
	"	Abd el-Aziz School (Old School of Law)	8	1,198
	"	Tewfikieh School... ..	10	220
	"	School of Art	1	30
	"	Boulaq Normal School for Girls	6	782
	"	Mohammed Aly School	5	225
	"	Dar el-Eloom School... ..	2	25
		Carried forward	—	18,003

List of works executed for different departments in 1904—(continued).

No.	Departments.	Locality.	Number of works.	Amount Total.
		<i>Brought forward</i> ...	—	18,003
5	Foreign Affairs	Ministry	3	17
6	Justice	Ministry	18	1,122
	"	Court of Appeal	6	17
	"	Mixed Tribunal	8	67
	"	Mixed Prison	3	115
	"	Ableen Tribunal... ..	1	1
7	War	Ministry	2	103
		Cairo Total ...	—	19,475
	<i>Delta.</i>			
1	Public Works :			
	Tanzim Office	Tantah... ..	1	1
	"	Kafr el-Zayat	1	45
2	Interior :			
	Mondirieh	Tantah	8	213
	Police Office	"	1	12
	Markaz	Mehallah	2	10
	"	Baltim	3	29
	"	Ziftah	4	4
	"	Talkha	1	2
	"	Dessook	2	11
	Quarantine... ..	Borollos	1	20
	Mondirieh	Chibine... ..	5	50
	Markaz	Menoof	1	2
	"	Tala	1	2
	"	Achnoon	2	48
	Police Post... ..	Namieh	1	9
	Markaz	Komesan	1	5
3	Public Instruction :			
	School	Tantah	4	38
	"	Chibine... ..	2	21
4	Justice :			
	Tribunal Indigène	Mehallah	2	6
	"	Dessook	1	2
		Delta Total ... L.E.	—	330
		Grand Total	—	20,005

Report of Annual Cost of Repairs and the Original Cost of Buildings.

CAIRO BUILDINGS.

BUILDINGS.	Date of Completion.	Cost.	COST OF WORKS EXECUTED					Total Cost of works executed.	Average cost per annum.	Percentage of original cost for year		Average Percentage of original cost per annum.	
			1900	1901	1902	1903	1904			L. E.	M.		
		L. E.	L. E.	L. E.	L. E.	L. E.	L. E.	L. E.	L. E.	L. E.	M.	L. E.	M.
Public Works	1870	40,000	1,759	3,664	3,341	1,613	2,636	13,033	2,617	6	39	6	80
Opera	1869	40,000	1,169	—	584	1,161	410	3,324	651	1	12	1	66
Ezbekieh Theatre	1869	8,000	—	1,110	244	120	95	1,562	313	1	18	3	92
Khedivial Geogr. Society.	1870	6,000	—	8	30	5	180	223	44	3	00	0	73
Institut Egyptien	1870	6,000	—	—	—	350	12	362	72	0	20	1	20
Restaurant Sami	1869	3,000	62	145	—	166	7	380	76	0	23	2	53
Khedivial Old Observatory	1860	4,000	199	51	26	1	—	277	55	—	—	1	36
Interior Ministry	1875	15,000	306	285	838	130	1,068	2,627	525	7	12	3	50
Governor	1873	28,000	436	455	651	652	1,189	3,383	673	1	24	2	40
Boulaq Police Store	1860	4,000	—	—	—	—	745	715	149	18	62	3	72
Shoubra Kharcol.	1875	2,000	20	36	200	—	—	256	51	—	—	3	55
Babel-Hadid Kharcol	1870	3,000	11	—	—	—	—	11	2	—	—	0	06
Police Stables	1850	1,000	—	—	—	10	60	70	14	6	00	1	40
Finance Ministry	1875	25,000	371	318	1,955	312	2,067	5,053	1,011	8	26	4	01
Post Office	1888	30,000	50	570	1,013	935	850	3,418	683	2	83	2	27
Cinadal Archives	1850	20,000	—	40	4	2	2,100	2,146	129	10	50	2	14
Emir Darfour's House	1850	1,500	—	40	80	9	10	139	27	0	65	1	80
Contrôle des Bijoux	1850	2,000	—	160	61	—	—	221	44	—	—	2	20
Khedivial Yacht Station	1900	3,000	—	—	315	—	—	345	64	—	—	2	30
Holy Carpet Office	1850	2,000	90	—	200	—	—	485	97	—	—	4	85
Printing Office	1900	16,000	8,225	2,954	100	639	107	12,015	2,409	0	16	1	50

Report of Annual Cost of Repairs and the Original Cost of Buildings.

CAIRO BUILDINGS—continued.

BUILDINGS	Date of construction.	Capl. L. E.	COST OF WORKS EXECUTED					Total Cost of works executed. L. E.	Average cost per annum. L. E.	Percentage of original cost for year.		Average Percentage of original cost per annum. L. E. M.
			1900	1901	1902	1903	1904			L. E.	M.	
Public Debt.	1890	20,000	—	22	27	403	49	501	100	0	24	0 50
Public Instrn. Ministry ...	1864	6,000	—	187	1,540	3	55	1,785	357	0	91	5 95
Old Khedivial Library ...	1864	6,000	—	62	7	—	—	619	123	9	15	2 05
School of Medicine ...	1880	25,000	88	19	1,500	158	468	2,233	446	1	87	1 78
Khedivial School ...	1864	18,000	569	747	138	1,323	792	3,571	714	4	40	3 96
Moultafian " ...	1900	23,000	—	—	79	20	61	160	32	0	26	0 13
Abbas " ...	1892	12,000	186	121	—	69	68	44	88	5	56	0 73
Old School of Law ...	1883	10,000	62	16	70	—	1,198	1,364	269	1	19	2 69
Tewfikieh School ...	1860	20,000	423	1,064	638	420	220	2,769	553	1	10	2 71
Routaq School of Arts ...	1868	6,000	435	128	301	180	30	974	194	0	50	3 23
Mohamed Aly School ...	1901	7,000	—	—	3,100	320	225	3,645	729	3	21	10 41
Dar-el-Flooun " ...	1900	11,000	—	—	16	—	25	41	8	0	22	0 07
Mohamadieli " ...	1823	3,000	118	—	100	25	—	243	48	—	—	1 60
Ministry of Justice ...	1875	8,000	513	—	127	92	1,122	1,854	370	14	02	4 63
Mixed Tribunal... ..	1868	30,000	243	385	58	204	70	960	192	0	23	6 40
" Prison ...	1865	2,000	57	66	80	—	129	342	68	6	15	3 40
Sayeda Zehab Tribunal ...	1875	3,000	—	—	25	52	—	77	15	—	—	0 50
Monsky Tribunal. ...	1875	2,000	5	—	476	21	—	502	100	—	—	5 00
Foreign Ministry ...	1875	8,000	—	108	705	103	30	916	183	0	37	2 28
War Ministry ...	1870	8,000	81	145	28	120	103	497	99	1	20	1 23

Report of Annual Cost of Repairs and the Original Cost of Buildings.

DELTA BUILDINGS.

BUILDINGS	Date of Construction.	Cost.	Cost of works executed				Total cost of works executed.	Average cost per annum.	Percentage of original cost for year.	Average percentage of original cost per annum.
			1900	1901	1902	1903	1904			
		L. E.	L. E.	L. E.	L. E.	L. E.	L. E.	L. E.		L. E.
<i>Garbich:</i>										
Mondirich of Garbich	1874	25,000	478	300	1,157	325	213	2,174	195	1.378
Delta Direction... ..	1902	1,419	—	—	—	3	1	1	—	0.094
Government School of Tanta... ..	1874	5,000	125	20	600	223	38	1,007	201	4.023
Police Stables, Tanta... ..	1877	2,000	1	—	—	60	12	73	15	7.337
Police Barracks, Tanta... ..	1893	1,000	—	40	—	21	—	64	13	0.850
Markaz Kafr-el-Zayat	1896-1898	2,114	—	15	72	5	—	92	18	0.866
Kafr-el-Zayat Tanzim Office... ..	1881	141	—	31	—	25	15	101	20	14.370
Markaz-el-Mahalla	1746	2,790	48	64	180	85	10	388	78	2.778
Tribunal Indigene Mahalla	1899	1,468	3	12	50	63	6	135	27	2.294
Markaz Talkin	1897-1898	1,520	21	85	9	22	2	140	28	1.840
Mohkemeh Charieh Zifta	1816	350	4	9	27	4	—	41	9	2.489
Tanzim Zifta Office	1897	158	11	—	—	9	—	23	5	2.870
Omda and Sarraf Zifta Office	1898	196	—	—	—	—	—	9	2	0.904
Stable of Zifta	1846	150	—	—	—	—	—	—	—	0.916
Markaz Zifta	1898	2,000	—	—	11	4	4	19	4	0.182
Police Markaz & Barricks of Santa	1894	2,000	51	12	33	63	—	189	38	1.898
Mohkemeh Charieh of Santa	1894	1,170	33	2	5	39	—	79	16	1.330
Tribunal Indigene of Dessouk	1897	2,000	—	—	171	—	2	173	35	1.728
Dessouk Markaz	1897	1,687	35	—	92	24	11	162	32	1.978
Foueh Markaz	1750	550	14	122	—	4	—	140	28	5.041
Garde-Côtes of Borollos	1846	500	—	—	6	15	—	51	10	2.023
Borollos Quarantine Station	1846	500	248	3	8	—	—	279	56	11.145
Bahim Markaz... ..	1902	968	—	—	—	—	20	24	2.89	0.605

Report of Annual Cost of Repairs and the Original Cost of Buildings.

DELTA BUILDINGS.—continued.

BUILDINGS	Date of Construction.	Cost.	COST OF WORKS EXECUTED				Total cost of works executed.	Average cost per annum	Percentage of original cost for year	Average Percentage of original cost per annum
			1900	1901	1902	1903				
		L. E.	L. E.	L. E.	L. E.	L. E.	L. E.	L. E.		
<i>Memutich:</i>										
Menouf Mondirich	1881	14,100	102	221	280	84	50	159	0.35	1.130
Old Government School Chibin *	—	—	63	72	—	—	23	31	36.50	—
Old Tribunal of Chibin-el-Kou	—	1,800	53	3	—	—	—	11	—	0.615
Police Barracks Chibin	1881	900	98	171	12	—	—	56	—	6.251
Stable of Chibin	1898	400	—	—	—	45	—	9	—	2.250
Markaz Menouf	1893	1,800	36	—	42	42	2	25	0.11	1.370
Markaz Tula	1886	2,000	45	30	70	89	2	47	0.10	2.363
Markaz Achmoun	1896	1,650	37	—	17	4	48	21	2.93	1.275
Markaz Kouesma	1896-1898	2,000	41	—	41	49	5	27	0.25	1.367
Police Station of Karinein	1897	100	—	—	—	12	—	2	—	2.303
Police Station of Nawaieh	1897	125	—	—	—	—	9	2	—	1.366

* NOTE.—This School was partly demolished and rebuilt in 1903. This expenditure was for repairs to remaining portion of old School.

LOCAL COMMISSIONS.

Viewed from the stand-point of economical working the Commissions still show a very low efficiency. A false sense of amour-propre prevents their requesting technical advice from our Inspectors. Their inexperience is exploited by local contractors, and considerable waste of public funds naturally results. Independence before Economy is evidently their watchword.

As an instance, a pump had been erected at Aswan by Messrs. Cook and Son and guaranteed till 1907. This pump required repairs in 1904. A local mechanic was consulted and charged with the work without contract or specification. The work was estimated by the High Commission Engineer at L.E. 17. A bill for L.E. 90 was presented. As the original cost of the pump was only L.E. 100 this may be characterised as a bad bargain.

At Aswan the design for the pump chamber was not submitted to the Public Works Department, with the result that the walls leaked like a sieve when the Nile rose.

The work further was pronounced as bad.

At Suez our Inspector has occasion to complain of the quality of road metal, which instead of passing a 0.5 ring, varied on 40% of the consignment from a maximum of 0.15 to a minimum of 0.7. Such metal is quite useless. It was discovered that no conditions of any kind had been imposed on the contractor furnishing. The metal had to be broken up by the road makers and cost in consequence 24 P.T. per M³ against a normal 16 P.T.

The following précis give an idea of the works undertaken in the various towns of Egypt subject to Local Commissions.

Benha.—A project for waterworks, amounting to L.E. 4,630, has been completed.

Minieh.—A similar installation here is estimated at L.E. 5,635.

Kafr-el-Zayat.—These Waterworks have been completed under the supervision of M. Abel. Well-water is supplied from a 6" bore by a 6 H.P. petrol engine.

The building cracked rather badly shortly after completion.

Kench.—In view of the tremendous inroads made by the Nile on the East bank it will be necessary to remove the pumping station entirely. The question is being studied by Mr. Richmond.

Suez.—A shed of 200 M² area for the temporary accommodation of pilgrims was erected here at a cost of L.E. 400.

Macadamising of roads is done by the Tanzim, the watering and scavenging are left to the Sanitary Service—the area swept daily is 26,267 and watered 190,167.

Mansoura.—A powerful pumping station has been built at a cost of L.E. 17,855.

Water is drawn from the Mansourieh Canal, and thrown into the filters by a 10 H.P. engine and centrifugal pump. The filtered water is lifted to a height of 36 metres by three petroleum engines of 17 H.P. working horizontal piston pumps, capable of delivering 20 litres a second each.

The Service reservoir contains 300 M³.

The total length of pipes is 1.4 kilometres.

The filters are of the Jewel or mechanical type.

A drainage project has been prepared and submitted to the Municipality. The town is lighted by electricity.

Zagazig, Menouf.—Projects for waterworks of these towns, estimated respectively at L.E. 6,640 and 4,860, have been presented to the High Commission.

The area of roads swept daily is 69,405 M² and watered 30,105 M²

Lighting is effected by means of petroleum.

Port Said.—There is no Commission in this town. The road Service (Voirie) is under the Governor's orders, and the Tanzim Engineer is intrusted with the execution of works.

This Service has an annual budget of L.E. 7,292.

The important works executed during 1904 are:—

1° Macadamising roads of an area of 28,242 M², executed by the Domaine Commun and delivered to the Tanzim Service.

2° Installation of electric light for private consumers only.

3° Enlargement of the "Zone franche."

The daily work consists in scavenging roads of an area of 421,700 M² and watering an area of 259,463 M².

The actual lighting is done by means of gas: a project is being studied to increase the number of the existing lamps by 50.

Ismailia.—The town has no Commission. The works of the "Voirie" or Road service are done by the Tanzim Engineer.

As regards the maintenance of roads, parks, and cemeteries of this town and Port-Tewfik, the Canal Company is granted an annual lump sum of L.E. 2,174 by Government, and attends to general upkeep without our interference.

Matarieh-Dakkaliyeh.—This town has lately been made subject to Tanzim regulations (May 1904); a special engineer has been appointed to survey the roads; some of these plans have already been approved by this Ministry, and in all probability a general survey of roads will be completed in two months.

The introduction of regulations will greatly ameliorate the state of this town. An annual sum for lighting and maintaining roads should be granted.

At Menuf a road skirting the town from North to S.E. has been raised and levelled. The old cemeteries are also being levelled.

Zagazig.—The work executed by this Commission during 1904 was confined to the watering, scavenging, lighting and maintenance of roads. The area of roads swept daily is 270,000 M², watered 200,000 M², and repaired and maintained, 156,388.

A portion of the town is lighted by petroleum lamps.

Tantah.—Three road bridges have been re-floored. Electric lighting was substituted for petroleum on the 1st September.

Mehallet-el-Kebir.—The Elhalaka Square was fenced in and the foot-path paved with cement tiles.

90 trees were planted.

The land of the east-birket which was filled in, is being consigned to purchasers. A project for filling in the west birket is being studied.

New street alignments are being drawn out.

Chihin-el-Kom.—The town is extending East and West; new alignments are being studied in the old town. A nursery for trees has been established on the bank of the canal.

The birket to the S.-E. of the town has been filled in.

Damietta.—The most important work executed during 1904 is the paving with Naples flag stones of a road area of 2,668 M², and the

construction of kerbs on a total length of 1,051 Ml. The cost of this work was L.E. 2,015.

The area of roads swept daily is 287,252 M², and those watered amount to 31,646 M².

The town is lighted by petroleum lamps.

Mit-Ghamr.—No work of any importance has been executed during 1904. Certain quarters have been made subject to the Tanzim.

Minet-el-Gamh, Simbellawin and Belbeis.—The Ministry has approved a request to submit these 3 towns to the Tanzim regulations. The execution of this scheme depends on the granting of a sum to allow of the appointment of a technical staff and the construction of new offices.

In the absence of legislation our efforts to regulate building operations, to prescribe the establishment of proper road widths and to introduce hygienic conditions, as far as construction is concerned, have remained unfruitful.

Unless we are allowed to align roads in concentric zones round every town, and are prepared to pay for expropriation whenever building permits are asked for, no improvement can be expected.

A calculation showing whether the total fund required for the above purpose exceeds or is inferior to the expenditure necessary for combating the epidemics engendered or nurtured by the present unsanitary conditions of village life, might usefully be prepared by the Finance Department.

The absence of correct plans of towns enormously hampers all municipal work. No levels exist. Our engineers have therefore no basis for the preparation of projects for waterworks, gasworks, electric lighting schemes or road alignments.

I trust that funds will shortly be granted to the Survey Department to enable them to execute this indispensable work.

It appears that the system of accounts in vogue at present leaves much to be desired. The compilation of proper statistics of work executed is at present impossible.

The Inspector of the Delta complains that the notices of meeting to be held do not contain a statement of the matters to be discussed. He is unable, therefore, to prepare the necessary notes, calculations, etc.

I attach, underlined, the proposals which I submitted in 1904, but which were not accepted.

I still consider the adoption of a system such as is here sketched out as indispensable for the efficient working of Local Commissions.

Towns.	Provided with local Commissions.	Local Commissions which have their own Engineers.	Town with Tanzim Engineers.
Assyut	Local Com.	—	Tanzim Engineer.
Assouan	"	—	"
Benha	"	—	"
Beni-Souef	"	—	"
Shibin-el-Kom	"	Road Surveyor L.E. 5½	"
Kouesma*	—	—	"
Damietta	"	—	"
Damanhour	"	—	"
Fayoum	"	L. C. Engineer	"
Guiza	"	—	"
Helouan	"	—	"
Kafr-el-Zayat	"	Road Surveyor L.E. 4½	"
Kena	"	—	"
Louxor	"	—	"
Esnâ	—	—	"
Mansourah	"	Road Surveyor L.E. 4½	"
Minieh	"	Road Surveyor L.E. 4½	"
Mehalla-Kobra	"	Surveyor of road L.E. 4	"
Talkha †	—	—	"
Samannoud †	—	—	"
Mit Ghamr	"	Surveyor of road L.E. 4	"
Menouf	"	Road Surveyor L.E. 5	"
Suez	"	Road Surveyor L.E. 5	"
Sohag	"	—	"
Guirga	"	—	"
Tanta	"	Road Surveyor L.E. 8	"
Zagazig	"	—	"
Zifta	"	Road Surveyor L.E. 4½	"
Port Said	no	—	"
Ismailia	no	—	"
Mutaria	no, but asked for	—	"
Rosette	—	—	"
Samannoud	—	—	"

Towns for which local commissions have been asked for.

* The Tanzim at Kouesma is supervised by the Engineer of Chibin-el-Kom.

† The Tanzim at Talkha et Samannoud is supervised by the Engineer of Mehalla-Kobra.

Sums granted to Local Councils Since their Creation in 1894 to 1904.

Towns.	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904
	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.
Tanta	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	3,000
Kafr-el-Zayat	—	—	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,200
Mehalla-el-Kehir	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,500
Zifta	—	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Chilim-el-Kom	—	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,800
Menouf... ..	—	—	—	—	—	—	—	1,200	1,200	1,200	1,500

Maintenance of Town Roads from 1904.

Town.	Year.	Water.		Lighting.		Roads and Gardens.		Sundries.		Totals.		Budget.	
		L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.
Tautah	1902	414	110	539	845	1,129	738	78	381	2,162	094	2,500	000
	1903	347	355	510	326	1,207	588	290	670	2,385	939	2,500	000
	1904	810	165	606	597	1,150	877	299	926	2,787	505	3,000	000
Kafr-el-Zayat	1902	39	000	375	000	464	800	16	200	895	000	1,000	000
	1903	39	000	375	000	464	800	16	200	895	000	1,000	000
	1904	45	500	465	440	435	000	148	298	1,094	238	1,200	000
Mehalla-el-Kébir	1902	29	000	382	238	569	149	38	043	1,018	430	1,200	000
	1903	29	000	388	294	578	489	1,391	507	2,387	290	1,200	000
	1904	31	085	386	608	621	998	261	557	1,307	308	1,500	000
Zefta	1902	5	022	476	741	556	392	35	560	1,075	718	1,200	000
	1903	8	210	475	796	580	701	84	987	1,149	694	1,200	000
	1904	54	739	515	011	581	281	112	687	1,266	751	1,200	000
Chilime	1902	39	311	412	800	652	791	69	689	1,174	621	1,500	000
	1903	39	350	417	270	667	524	10	128	1,158	272	1,500	000
	1904	45	350	575	340	832	701	114	199	1,507	520	1,800	000
Menouf	1902	52	263	167	901	132	000	197	636	549	803	1,200	000
	1903	20	275	175	000	134	215	160	096	489	586	1,200	000
	1904	17	000	176	560	132	798	199	172	525	530	1,500	000

Water Raising Machinery—Cost of Water, 1904.

Towns.	Population.	Total Budget.	Hours Work of Pump.	Drinking Water Diameter Pump in inches.	Total lift (mean).	Approx. $\frac{1}{2}$ litres per sec.	W.H.P. or E.H.P. \times metres lift $\div 75$	$\frac{1}{2}$ M ³ lifted per hour.	Cost in millimes per hour of					Total.	Cost per cubic metre.	Cost per one E.H.P.	Number of inhabitants that can be supplied with drinking and house water at 20 litres a head, 10 hours by present pump.
									Petroleum.	Bottom waste.	Trusses.	Driver's Wages.					
Tanda ...	57289	3,000	—	—	—	—	—	—	—	—	—	—	—	—	—	57289 100 ¹	
Kafr-el-Zaynt...	10231	1,200	3	6	22,000	13.00	3.546	46.66	0.0252	0.0005	0.002	0.027	0.0517	0.00117	0.013	—	
Mekalla	31791	1,500	2	6	13,180	7.22	1.27	26.00	0.00809	—	0.00411	0.0083	0.0205	0.000788	0.01611	—	
Zefia ...	14039	1,200	1 15	3	25,000	5.50	0.80	20.00	0.0176	0.0044	—	0.0181	0.0374	0.00187	0.046	10000 71 ²	
Chilim...	20705	1,800	2 30	3	73,66	1.70	0.61	17.00	0.00625	0.00025	—	0.0184	0.0249	0.00146	0.040	—	
Menouf.	20683	1,500	8	—	220,000	11.11	0.37	40.00	0.01386	0.000648	0.000621	0.01223	0.028462	0.0007115	0.76921	36000 17	
				—	36,000	1.25	—	4.50	—	—	—	0.00625	0.00625	0.001388	—	—	

¹ Hand pump

² Sile water pump for street watering

³ Pure water pump.

⁴ Street watering and pure water supply.

⁵ Water Company.

Lighting and Sundries, 1904.

Towns.	Area of road lighted.	Kind of lighting.	Number of lanterns.	Cost per lantern.		Annual cost of lighting (total).		Annual cost of lighting per inhabitant.		Sanitary Budget.		Sanitation expenses per inhabitant.		General Fund.		Purchases of Zindai Tannin.	Remarks.
				L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.		
Tantah... ..	166437.32	Petroleum ...	339	1.575		534.000		0.008299		200.000		0.003491		—		40.000	The inspection of the lighting is done by the Police, the "Fathis," and sometimes by the Tannin service.
57,200 inhabitants	166437.32	Electricity ...	200	2.500		750.000		0.01302		200.000		0.003491		—		40.000	
Kafr-El-Zayat ...	77940.00	Petroleum ...	170	2.206		375.00		0.037		100.000		0.010		—		—	
9,854 inhabitants														—		20.000	
Meballa el-Kebir ...	240000.00	Petroleum ...	120	2.842		540.00		0.017		100.000		0.00314		—		—	The inspection of the lighting is done by the Police, the "Fathis," and sometimes by the Tannin service.
31,400 inhabitants														—		—	
Zifra	89500.00	Light (Croizat)	100	4.750		475.000		0.0338		100.000		0.0071		42.000		10.000	
13,724 inhabitants														—		—	
Chedim-El-Kom ...	68822.00	Light (Croizat)	75	5.960		447.000		0.021		150.000		0.0043		55.000		10.000	The inspection of the lighting is done by the Police, the "Fathis," and sometimes by the Tannin service.
20,512 inhabitants														—		—	
Menouf	32600.00	Light (Croizat)	35	5.000		175.00		0.00846		100.000		0.00183		52.000		32.000	The inspection of the lighting is done by the Police, the "Fathis," and sometimes by the Tannin service.
19,726 inhabitants														—		—	

INDEX:

Tableau indiquant les travaux et le personnel de la Voirie à Damanhour.

[illegible]

Lighting and Sundries.

Towns.	Area of road lighted.	Kind of lighting.	Number of lanterns.	Amount of coal per lantern.		Annual cost for lighting total.		Annual cost of lighting per inhabitant.		Sanitary Budget.		Sanitation Expense per inhabitant.		Reserve Fund.		Purchase of Zhabat Taugim.		Cost of Admin-istration.	
				L.F.	M.	L.F.	M.	L.F.	M.	L.F.	M.	L.F.	M.	L.F.	M.	L.F.	M.	L.F.	M.
Zagzig	200,000	Petroleum	202	1.976		399,206		0.0117		200.	—	0.00516		351,000		108,190		860.232	
Suez	190,167	Electricity	135	5.185		690,975		0.04070		200.	—	0.00663		258,052		1.—		352.786	
Port Said	384,390	Gas	312	7.330		2,306,815		0.03220		—	—	—		—		—		189	
Mansourah	335,038	Electricity	120	2.260		948,437		0.02625		150.	—	0.0046		1,115,249		71,751		—	
Damietta	200,000	Petroleum	346	0.797		276,039		0.038900		—	—	—		994,801		139,564		166.906	
Mit Gaur	60,400	Petroleum	170	1.713		291,311		0.02240		12.	—	0.00617		151,661		28,168		116.926	
Boula	35,000	Petroleum	51	5.143		241,739		0.02856		100.	—	0.01181		25.—		80.—		—	

Maintenance of Town Roads during 1904.

Towns.	Years.	Water.		Lighting.		Roads and Gardens.		Sundries.		Totals.		Budget.	
		L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.
Zagazig ...	1901 ...	...	130.725	399.206	...	1,903.294	...	907.609	...	2,740.831	...	2,545.	...
Suez ...	1901 ...	...	89.365	699.975	...	1,273.835	...	366.159	...	2,428.331	...	2,620.	...
Port Said ...	" ...	...	180.	2,220.	...	5,110.	...	82.	...	7,592.	...	6,992.	...
Mansourah ...	" ...	...	87.320	948.437	...	1,151.950	...	3,340.223	...	5,301.620	...	10,000.	...
Damiette ...	" ...	...	—	276.030	...	1,426.796	...	1,138.415	...	2,841.251	...	2,330.	...
Mit Gaur ...	" ...	...	39.599	291.311	...	1,141.975	...	538.820	...	2,011.705	...	1,278.150	...
Bouha ...	" ...	...	11.914	211.739	...	580.772	...	284.183	...	1,148.698	...	1,000.	...

Sums Granted to Local Councils Since their Creation in 1894 to 1905.

Towns.	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905
	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.
Zagazig ...	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	3,000
Suez ...	1,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,500	2,500
Mansourah ...	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,750	2,750	4,000
Damiette ...	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	2,000	2,000
Mit Gaur ...	—	—	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,150
Bouha ...	—	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,150
Port Said ...	5,370	5,370	5,390	5,630	5,630	5,630	6,142	6,292	7,292	7,292	7,292	7,292

Water-Raising Machinery—Cost of Water.

Town.	Hours work of pump during the year.	Diameter Pump in Inches.	Total lift mean.	Approx. Q litres per sec.	W. H. P. or F. H. P. litres \times metres lift $\div 12$.	Q M ³ lifted per hour.	COST IN MILLIMES PER HOUR OF					Cost per cubic metre.	Cost per one F. H. P.	Remarks.
							Petroleum.	Waste cotton.	Fire.	Driver's Wages.	Total.			
Zagazig	2795	4	10.75	15.1	2.16	54.34	8.5	4.2	1.9	23.	37.6	0.7	17.4	All these pumping stations have only been erected for watering purposes.
Bonha	2411	3	10.5	2.	1.	7.	6.6	4.6	0.7	8.6	20.5	3.	20.5	
Mit Gaur	844	3	7.43	5.35	0.53	19.25	3.5	—	0.6	21.3	25.4	1.32	48.	
Suez	652	3	10.10	18.33	2.47	66.	10.	14.	1.	64.4	89.4	1.35	56.2	

PUBLIC LIGHTING, CAIRO CITY.

BUDGET.

The budget was increased in 1904 by L.E. 2060.

For this sum 311 new lamps were installed making a total of 3813 lamps in the City.

As stated in previous reports, over 6000 more lamps are urgently required for public lighting. At present rates this represents an approximate cost of L.E. 43,000 p.a. I do not propose to instal any more lamps until a considerable diminution in the price is conceded by the Company.

INCANDESCENT LIGHTING.

A total of 3135 lamps are now fitted with incandescent burners. The balance of 678 flat-flame burners will probably be transformed during 1905.

FINES.

The following fines were inflicted on the Company during 1904.

	L.E.	m.
For lamps extinguished and giving defective light	32	070
For lamps with broken glass	0	964
For impure gas (6 nights)	11	572
Total	L.E. 44	606

No fines were inflicted for deficient illuminating power.

DEFECTIVE LIGHTING.

The following is the comparison of number per cent lamps reported during 3 years as giving defective light. In 1902 the flat-flame burner was in general use:—

YEAR	Lamps extinguished.	Lamps giving less than standard flame.
1902	586	43,800
1903	512	10,417
1904	1155	9,479

The increase in 1904 of "lamps extinguished" is due to the breakage of incandescent mantles.

LABORATORY TESTING.

A result of the "gas testing" forms the subject of a separate note from Mr. Lucas.

STAFF.

No changes have been made in the Staff.

Mr. Megalogeni continues to give entire satisfaction.

Comparison of Cost of Public Lighting by incandescent Gas, Willesden, 1904, and Cairo under old Contract, 1873, and new convention 1905.

PLACE.	No. of hours each lamp burns per an.	Quantity gas consumed per lamp per hour.	Quantity gas consumed per lamp per an.	Cost per lamp per hour.	Cost per M ³ Gas.	Cost per lamp per an.	Population 1901.
	Hours.	Litres.	M ³ .	Frs.	Frs.	Frs.	
Willesden, 04	3,940	91	359	0.02	0.2225	79.8	114.815
Cairo : 1873 Contract ...	3,157	140	442	0.055	0.3928	173.61	
Cairo : New Convention | 1905 ... .. |	3,157	80	252.6	0.0335	0.4187	105.76	

CART SERVICE.

ESTABLISHMENT—ANIMALS.

No. of animals in service on 1-1-1904	...	...	...	...	...	119
No. of animals purchased during 1904	...	...	...	...	...	51
						<u>170</u>
						170
Deduct :						
Animals cast, "old age"	...	...	...	...	...	3
.. destroyed, "chronic lameness"	...	...	...	...	...	1
.. deaths due to accidents	...	...	...	...	...	2
.. deaths "natural causes"	...	...	...	...	...	2
.. Sold to Port Said Tanzim	...	...	...	...	...	4
						<u>12</u>
						12
Total in service on 31-12-1904	...	...	...	...	...	<u>158</u>

As usual the new animals were purchased through the veterinary Service.

In view of the increased work proposed for 1905, at least 60 more animals must be added to the establishment.

The average cost of animals during the past 3 years works out as follows :—

						l.f.	m.
1902	...	...	...	...	...	22	5
1903	...	...	...	...	...	23	8
1904	...	...	...	...	...	23	4

HEALTH.

The health of the animals has been excellent. The daily sick rate during the past 3 years is shown below :—

YEAR.	Daily average No. of animals in service.	Accidents.	Normal sickness.	Total.	Percentage.
1902 ...	118	1.9	2.5	4.4	3.7
1903 ...	119	1.3	1.5	2.8	2.4
1904 ...	136	0.6	2.7	3.3	2.4

There have been no deaths from infectious diseases.

STABLING.

A grant of L.E. 5000 is to be given in 1905 for the stabling of 200 animals. Plans are being prepared and the building should be finished during the course of next year.

RECEIPTS

The receipts for work done, stores supplied, etc., to outside Services amounted to L.E. 1,507 M. 982

STAFF.

No changes have been made in the Staff.

Mr. Potheary, the stablemaster, has, as usual, performed his duties excellently.

HELOUAN WATER SERVICE.

In 10 years the amount of water supplied to private persons has more than doubled.

The receipts from private consumers are L.E. 395 in excess of 1903. An ample supply of water has been kept up throughout the whole year.

The total gross profit for the year amounts to L.E. 2,052.617.

A sum of L.E. 606 figures as extraordinary expenditure. Of this sum L.E. 310 was spent for cast iron pipes, valves, etc. L.E. 107 for New Frager water metres and L.E. 190 for transport from Ghizeh and erection of two 65 H.P.

Lancashire boilers. The erection of these boilers (which are practically as good as new) gives us a large steam reserve for many years to come. 110 lin. metres of 20 c/m. pipes have been laid from the town to the reservoir to replace the 15 c/m. pipes on main delivery from pumps. All corroded and small diameter pipes have now been removed and replaced by new ones. This completes the work on the main delivery.

Great dissatisfaction exists in Helwan because no measures have been taken as yet to supply the town with filtered water.

The cost would not be great as a complete sand filter plant, similar to the one in Ghizeh, could be put up for L.E. 5000, or a mechanical filter plant for L.E. 4000.

Mr. Curtis estimates that the cost of water wasted in flushing pipes, and continual cleaning of mud from the reservoirs, would be sufficient to pay 3% per annum on the cost of the filters.

COMPARATIVE STATEMENT OF RECEIPTS AND EXPENSES
1904 AND 1903.

RECEIPTS	1904		1903		DIFFERENCE IN 1904				For comparison 1894.	
					More.		Less.			
	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.
Water supplied to private persons ...	2,789	125	2,394	687	394	738	—		1,291	809
Government Services	1,393	191	1,468	012	—		74	821	767	570
Total Receipts L.E.	4,182	616	3,862	699	394	738	74	821	2,059	379

IN FAVOUR OF 1904. L.E. 319 917 ^m m.

EXPENDITURE	1904		1903		DIFFERENCE IN 1904			
					More		Less	
	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.
Ordinary expenses	1,523	877	1,536	618	—		12	741
Extraordinary Expenses	606	122	251	915	354	207		=
Total Expenditure L.E.	2,129	999	1,788	533	354	207		12 741
Gross Profit... ..	2,052	617	2,074	166	—		—	

CAPITAL L.E. 12,000.—

GROSS PROFIT, L.E. 2,052 617 = 17 % DIVIDEND.

	1904	1903	1894
WATER SUPPLIED TO PRIVATE PERSONS.			
1st Abonnement M ³	2,260	3,100	84,962
2nd By Water metres "	169,291	140,885	
3rd Railway "	18,145	16,199	
4th Borne-fontaine "	3,618	3,864	
Total... .. M ³	193,314	164,048	
WATER SUPPLIED GRATIS TO GOVERNMENT.			
Local Commission M ³ 66,976	72,566	78,023	76,757
Tanzim Garden " 5,590			
Tanzim Office... .. 1,775	11,436	11,925	
Police 3,940			
Washing pipes 2 " 5,721			
Grand Hotel 1,787	17,015	16,978	
Bathis... .. 2,247			
Hotel Garden... .. 12,981			
To Helwan Railway —	10,430	10,915	
Station Garden 4,682			
Midan Said 4,721			
Fontaines Electriques 4,027			
Total... .. M ³ 111,447			
Total... .. M ³	304,761	281,889	161,719

GHIZEH AND GHEZIREH WATER SERVICES.

As shown in attached statement the total receipts for the year were L.E. 7,570, and the total ordinary expenditure L.E. 3,988. The normal Budget is L.E. 5,987.

The new engine and pump erected on the Bahr-el-Aana, Ghezireh, in 1903, has been working satisfactorily throughout the year.

The large compound engine with its boiler, which was removed from Ghezireh, has been erected in Ghizeh in a new building, and is now working a 50 c/m Dinmont centrifugal pump.

Modifications have been made to No. 4 Beam engine; the large three throw pump which formerly worked low lift from the river now supplies the large tanks over the engine house. A new pump has been erected to supply the high pressure chimney tank.

The total cost of this work, including new buildings and pump, was L.E. 1,496. The result is most satisfactory, as in addition to the fact that we are able to give an ample supply of water for all the different lifts with ease, the economy in coal alone amounts to 337 tons, which in addition to the economy in packings, rubber and leather valves, amounts to about L.E. 650 per annum.

5,444 lin. met. of new mains were laid down at a cost of L.E. 2,612. For part of this work the Ministry of Finance gave a separate grant of L.E. 1,900; the remainder was paid out of ordinary budget.

A complete deep sand filter plant has been put down with a filtering area of 1,500 M², and sedimentation basins of 3,200 M³ capacity. With the double Service as existing in Ghizeh this plant is ample for a supply to a town of 35,000 inhabitants; this supply can be doubled at a very small cost. The total cost of the work, including gravel and sand for the filters, came to L.E. 2,800. Of this sum L.E. 1,500 was paid in 1904.

Judging from the weekly reports of the Survey Department laboratory it must be admitted that, both from the chemical and bacteriological points of view, the working of the filters is entirely satisfactory. When these analyses have extended over one complete year the efficiency of sand filtration of Nile water can be scientifically gauged.

Filtered water is now supplied to the whole of the town of Ghizeh, the Agricultural College, Polytechnic, H.H. Prince Hussein, and the Ghezireh as far as the War Office Bungalow.

In the near future further extensions of the pipes system will be necessary in connection with the estate of the Ghezirch Land Co. Zamalek and the Zervudaehi estate; the expense will be considerable, while no very great return on the expenditure can be expected for some years to come. Supplementary grants will be necessary for this work.

80 New Frager water metres of different sizes have been purchased at a cost of L.E. 422.

In the Ghizeh shops, work for outside Departments was executed to the amount of L.E. 3,698, details of which are attached. Owing to the haphazard way in which the water rate was applied by the Finance Department and the number of abonnements granted at less than cost price to Government Departments and others it has been very difficult for us to prove by figures that the actual revenue plus the loss on gifts of water constituted a large percentage of profit.

I have therefore prepared tables which prove that our profits on the original capital of 28,880 amounted to 9.4 %.

By raising our rates to the level of those of the Cairo water works, the profits on the increased capital of L.E. 40,000 may be raised to 25 %.

VALUATION OF GHIZEH AND GHEZIREH WATER SERVICES

BUILDINGS.

Engine House...	...	...	...	...	...	...	...	...	L.E.	6,000
Boiler House	...	...	...	...	...	...	...	...	"	500
Shops	...	...	...	...	...	...	...	...	"	500
Magazines	...	...	...	...	...	...	...	...	"	300
Dwelling House	...	...	...	...	...	...	...	...	"	700
Office...	...	...	...	...	...	...	...	...	"	250
Filters	...	...	...	...	...	...	...	...	"	2,800
Engine House, Ghezireh	...	...	...	...	...	...	...	...	"	500
										<hr/> L.E. 11,550

MACHINERY.

3.—40 N. H. P. Horizontal compound concerning engines	...	...	...	...	...	...	...	L.E.	3,000
3.—Pumps for chimney tank	...	...	...	...	...	...	...	"	750
4.—Centrifugal pumps	...	...	...	...	...	...	...	"	700
4.—Boilers each 60 N. H. P...	...	...	...	...	...	...	...	"	1,000
Shops machinery	...	...	...	...	...	...	...	"	1,200
1.—30 N. H. P. semi-portable Engine, Ghezireh	...	...	...	...	...	...	...	"	600
1.—Centrifugal pump	"	"	...	...	...	...	...	"	220
									<hr/> L.E. 7,470

PIPES.

C.F. pipes 35 years=20,000 met.=1,820 ton	...	...	L.E.	5,460
C. I. pipes new=17,000 met.=910 ton	...	...	"	7,000
				<hr/> L.E. 12,460
C. I. pipes, to complete system	...	...	8,520	.. 8,520
				<hr/>
Total...	...	...	L.E.	40,000
				<hr/>
Of the above there remains unspent...	...	...	L.E.	12,670
				<hr/>

GHIZEH AND GHEZIREH WATER SERVICES.

	1901	1903
WATER SUPPLIED IN 1901 AND 1903		
Ghizeh Town filtered water,... .. M ³	7,353	—
.. .. unfiltered water	11,126	17,438
Ghizeh and Ghezireh filtered water	1,996	—
.. .. unfiltered water	145,166	117,482

WATER SUPPLY FOR AGRICULTURE.

By gravitation, feddans	621	5k	12s
By pressure, feddans	210	21k	10s

ABONNEMENT.

Agriculture School	L.E.	50	—
Survey Department ... .. .	..	50	—
Caracol English Bridge ... .. .	..	20	—
Khedivial Sporting Club... .. .	..	50	—
Scavenging and Watering Service ... .. .	..	421	—
Polytechnic School ... .. .	..	50	—
Anglo-American Hospital ... .. .	..	30	—
War Department... .. .	..	43	—
Contractor Zoological garden ... .. .	..	12	126
Total... .. .	L.E.	726	120
H. H. Prince Hussein... .. .	..	45	—
Total... .. .	L.E.	771	126

Statement of Receipts and Expenditure of the Ghezireh and Ghizeh Water Service for the year 1904.

RECEIPTS FROM		Quantity.	Existing Tariff Price.	Amount.	According to Tariff Price.	Water Co. Tariff Amount.	1904.
			L.E. M.	L.E. M.	L.E. M.	L.E. M.	
Private consumers filtered water M ³	9,349	10	01.25	116 981	60	02.5	223 720
Private consumers unfiltered " "	150,230	10	00.5	1,064 389	40	01.2	1,875 432
Garden Irrigation by pressure water, feldmans	264,163.13	13	—	317 082	10	—	1,067 —
Lands Irrigation by gravitation feldmans	183,223.12	1	—	761 215	1	—	761 245
WATER SUPPLIED TO GOVERNMENT SERVICES							
Garden Irrigation by pressure, feldmans	184,112.21	13	00	2,775 133	10	—	7,758 —
Lands Irrigation by gravitation, " "	437,123.21	1	00	1,749 116	1	—	1,749 140
Watering roads (Ghizeh and Ghazireh rd. incl. 200,000) " " " " " M ³	150,000	—	—	121 —	101	00.8	1,200 —
Scavenging and Watering Service, Ghazireh stables " " " " " "	—	—	—	—	—	—	50 —
Agriculture School " " " " " "	—	—	—	50 —	—	—	208 —
Survey Department " " " " " "	—	—	—	50 —	—	—	195 —
Cairo English Bridge " " " " " "	—	—	—	20 —	—	—	42 —
Khedival Sporting Club " " " " " "	—	—	—	50 —	—	—	797 —
El H. Prince Hussein " " " " " "	—	—	—	45 —	—	—	15 —
Polytechnic School " " " " " "	—	—	—	50 —	—	—	136 —
Anglo-American Hospital " " " " " "	—	—	—	30 —	—	—	60 —
War Department (Zamalek) " " " " " "	—	—	—	43 —	—	—	100 —
						L.E. ...	10,081
						L.E. ...	10,277
						L.E. ...	003
ACCOUNTING TO CAIRO WATER CO. TARIFF.							
Receipts...		...	...	...	...	...	Capital L.E. 40,000
Expenditure:							
Salary and pay...	L.E. 2,000						
Fuel...	" " " " " 1,000						
Oil, etc.	" " " " " 175						
Sundries	" " " " " 600						
Depreciations of Buildings and machines	" " " " " 1,222						
Repairs taxes	" " " " " 300						
Profit	" " " " " 10,081						
		= 25.2 % dividend.					

GHIZEH NURSERY AND TREES IN SECTION No. 4.

In 1904, 5981 trees and 32,267 pots of different kinds of flowers were taken from the Nursery.

As usual this Service was very successful at the different Horticultural shows. Mr. Curtis won in March a gold medal and a special first class prize. At the chrysanthemum show he took the medal of the Royal Horticultural show of England and a special first class prize, while at the Rose show two special first class prizes were awarded to the Service which he represents.

The condition of the trees in Section No. 4, West of the Nile, is unsatisfactory. On five separate occasions the tramway wires have been broken owing to trees falling. Serious interruptions to the trains have resulted. A number of trees in a dangerous state of decay have been removed.

Continual demands from the Tramway Co., Telephone Co. and the Telegraph Service to lop the lower branches ruins the appearance of the trees, encouraging as it does high growth thus leaving the road without shade and the trees without form.

Timber and branches removed in 1904 were sold for L.E. 170.

*Detail of receipts and expenditures for the Ghizeh Nursery
and Trees Section No. 4.*

TREES, SHRUBS AND FLOWERS SUPPLIED TO GOVERNMENT GARDENS.									
<i>1.—Cairo Tanzim service.</i>									No.
Shrubs and trees	...	...	...	...	...	...	...	...	644
Flowers in pots...	...	...	...	...	...	...	...	...	16,918
<i>2.—Ezbekieh Garden.</i>									
Shrubs and trees	...	...	...	...	...	...	...	...	312
Flowers in pots...	...	...	...	...	...	...	...	...	12,818
<i>3.—Coast Guards for Mersa Matrooh.</i>									
Trees	...	...	...	...	...	...	...	...	257
<i>4.—Fayoum Tanzim</i>									
Flowers in pots	...	...	...	...	...	...	...	...	520
<i>5.—Local Commission of Damietta.</i>									
Trees	...	...	...	...	...	...	...	...	200
<i>6.—Abdazieh Barracks.</i>									
Flowers in pots...	...	...	...	...	...	...	...	...	887
Trees	...	...	...	...	...	...	...	...	13
<i>7.—Boulak Arsenal.</i>									
Trees	...	...	...	...	...	...	...	...	20
<i>8.—English Club.</i>									
Trees	...	...	...	...	...	...	...	...	11
<i>9.—Sanitary Department.</i>									
Trees	...	...	...	...	...	...	...	...	15
<i>10.—Section No. 4.</i>									
Trees	...	...	...	...	...	...	...	...	180
To private persons, 4476 trees	...	...	...	...	...	...	...	...	L.E. 426 938
To private persons, 1114 flowers in pots	...	...	...	...	...	...	...	...	" 170 000
Total	...	...	...	...	...	...	...	...	L.E. 1,259 733

662 795

EXPENSES.

Salaries	...	...	...	...	...	...	...	...	L.E. 699 757
Stores and tools	...	...	...	...	...	...	...	...	" 181 725
Carts	...	...	...	...	...	...	...	...	" 181 630
New shed	...	...	...	...	...	...	...	...	" 180 713
Total...	...	...	...	...	...	...	...	...	L.E. 1,246 825

SECTION No. 4.

The roads on this Section are in good condition. 6,955 Sq. met. of new roads have been made, while 14,768 sq. met of old roads have been remacadamized.

The total expenditure on Section No. 4 amounted to L.E. 1,959.020.

The Ghezireh roads would be improved if money could be found for putting in stone kerbs and constructing hard foot-paths.

WORKS EXECUTED BY THE GHIZEH WORKSHOP IN THE YEAR 1904.

	L. E.	M.
Survey Department	328	208
Esbekieh Garden	387	621
Ghizeh Nursery	367	819
Scavenging and Watering Service, Sanitary Department...	297	905
Helouan Water Service	203	385
Agricultural Show	357	900
Agricultural School	197	173
Cairo Tanzim	676	286
Benha Bridge	87	175
Anglo-American Hospital... ..	73	069
School of Law	401	065
Mr. Davey's house water installation	90	111
War Department (Zamalek)	46	315
Pyramid Brewery	6	720
Towns and Buildings, P. W. D.	83	400
Ghizeh Town Local Commission	3	558
Khedivial Sporting Club	5	837
Helouan Baths and Hotels	7	874
Polytechnic School	20	502
Private Accounts	56	080
Total... ..	3,698	003

ESBEKIEH GARDEN.

RECEIPTS FROM GATES... .. L.E. 1,448 149

EXPENDITURE ON COLLECTION:—

	L.E.	M.
Salaries, gate collectors and garden rangers	348	000
English Military Band... ..	210	000
Construction of iron railing round site of lake 411 lin. metres	202	479
9 New Lux lamps... ..	177	790
	L.E.	938 269

EXPENDITURE:—

	L.E.	M.
Gas from Gas Co.	313	679
Sundries	27	345
Workman for lighting	37	600
7 New Lux lamps	151	760
Petroleum	33	079
		L.E. M.
		563 463
Water	548	001
Salaries, chief gardener, Boats, gaffers, and Clerk...	462	000
Gardeners	385	027
Native Band	236	380
Carts	26	820
Cleaning cess-pools	15	906
Stores, repairs, etc.	246	403
Total... ..	L.E. 2,484	000

DEBIT

	L.E.
Budget	<u>2,484</u>
Gate Money	<u>1,448</u>
Total Revenue...	<u>L.E. 3,932</u>

CREDIT

	L.E.
Expenditure... ..	938
Balance... ..	510
To Credit... ..	<u>L.E. 3,932</u>

There is nothing special to report as regards this Service.

The gate receipts show an increase over 1903 of L.E. 186.767.

A new railing has been made round the site of the old lake, and trees planted on the site. This site was raised considerably to make a

dry playground for children, but since it was finished it has been monopolised by the different fêtes Committees.

For nearly two months it has been occupied by a temporary theatre, which is still standing.

It is quite impossible to keep this garden in a proper state unless Government ceases to permit public fêtes to be held here.

I would strongly urge that all fêtes be held in the Finance garden at Ghezireh, which does not, like the Esbekieh garden, contain rare botanical specimens, and constitute the single lung of a large city.

ELECTRICAL SERVICE.

CAIRO TRAMWAYS.

No extensions have been made since the opening of the Shoubra line in May 1903: traffic, however, has again considerably increased. The number of passengers conveyed has increased by 32%, the total receipts by 33%. This result is to a great extent due to the fact that a whole year's revenue of the new lines of Shoubra and Rod-el-Farag has been credited for the first time.

The Pyramid line too has been much used, especially on Sundays and holidays, when it was necessary to run supplementary trains. On account of the great length of the line the drop of voltage in the feeders assumed excessive proportions, and involved a considerable diminution in the speed of the cars. The Tramway Company have remedied this inconvenience by erecting a booster in their generating station. They also increased the capacity of the station by putting down a new set of 375 Kw.

Statistics are given in the adjoining table. Since April, 1904, the Company have established a steamboat service on the Nile from Cairo to the Delta Barrage. This line has been fairly well-frequented.

	YEAR ENDING 30 JUNE.		INCREASE
	1903	1904	
Duration of concession	50 years.		
Date of expiry	1946		
<i>A—Traffic.</i>			
Total number of passengers	19,225,331	25,406,133	32.1
Average daily number of passengers ...	52,672	69,416	
Same in % of population	8.2	10.5	
Train kilometres	4,378,580	5,271,003	20.6%
<i>B—Lines and Cars.</i>			
Length of single track	15,681	no change.	
Length of double track	27,294		
Total length of lines	42,975		
Number of motor-cars	128	163	35
Number of trailers	79	99	20
<i>C—Financial.</i>			
Capital (shares) Frs.	6,000,000	6,000,000	
Capital (debentures)	7,065,500	6,964,500	
Capital outlay	13,261,000	13,488,500	1.7%
Gross revenue (tramlines only)	2,571,242	3,370,570	33.2 %
Working expenses (tramlines only)	1,200,749	1,690,000	40.2 %
Net profit	1,348,790	1,702,781	26.2 %
Working expenses to revenue	47.5	50.2	
Interest on share capital	13.7%	18.4	
Directors' fees Frs.	85,232	101,238	
Carried to reserve fund (5%)	47,351	63,274	
Distributed to shareholders	820,000	1,100,000	
Gross revenue per train kilometre	0.58	0.64	

ALEXANDRIA TRAMWAYS AND RAMLEH RAILWAY.

Since the introduction of electrical traction on the Ramleh lines on January 25th, 1904, traffic has increased considerably. Owing to breakdowns in the high tension cable connecting the Bulkeley substation with the generating station, the service was interrupted several times, with the result that numerous complaints were made.

In the autumn of 1904 the Company put down, at a considerable depth, a second cable of greater mechanical resistance. This new cable, which has worked since October, 1904, is giving entire satisfaction.

The number of electric trains running in one direction is now 300 a day, as against 50 steam trains in previous years. There are also 5 more stations on the line, bringing the total to 21.

The Alexandria Tramways have transformed $1\frac{1}{2}$ Km. of single track into double track, thus improving traffic. Ten new cars will come into service this year.

The following tables give further information with regard to the traffic of the two concerns.

ALEXANDRIA TRAMWAYS.

	YEAR ENDING 31ST DECEMBER		INCREASE.
	1903	1904	
Length of single track m.	7,033	5,500	
Length of double track "	17,164	18,800	
Total length of track "	24,197	24,300	
Number of motor cars "	55	56	
Number of trailers "	45	44	
Number of passengers conveyed	9,293,272	11,721,607	26 %
Gross revenue L.E.	50,815	61,401	20 %
Working expenses "	32,510	32,200	1 %
Net profit "	18,305	28,900	58 %

RAMLEN RAILWAY.

	YEAR ENDING 30TH SEPT.		INCREASE.
	1903	1901	
Length of single track m.	1,125	1,025	
Length of double track "	11,000	10,700	
Total length of track "	12,125	11,725	
Number of motor cars "	22	30	
Number of trailers "	34	37	
Number of passengers conveyed	3,062,749	1,307,181	40 %
Gross revenue L. E.	38,140	18,246	26 %
Working expenses "	20,446	20,317	13 %
Net profit "	17,694	17,929	7 %
Interest distributed on shares	5 1/2 %	19 %	

CAIRO ELECTRICAL SUPPLY.

	Year ending 30th June.		Increase.	On Dec. 31st
	1903	1904		1901
<i>General.</i>				
Number of consumers	1,400	1,675	19 %	1,843
Units sold KWH	529,478	668,098	26 %	354,097
Number of lamps connected (10 cp) ...	61,160	73,075	18 %	81,312
Number of arc lamps connected ...	97	125	29 %	141
Number of electric motors	18	20		23
Power of electric motors HP	95	100		106
Cable laid during year	{	{	{	{
} high tension m.	6,420	1,765		1,435
} low tension ..		5,339		2,485
Total length of cable	{	{	{	{
} high tension ..	29,186	30,951		32,386
} low tension ..	44,926	50,465		52,950
Units sold per cp lamp KWH	8.25	8.94		
<i>Financial.</i>				
Capital Frs.	3,000,000	3,000,000		3,000,000
Gross revenue (units sold)	529,319	668,098	26 %	354,097
Working expenses	312,780	449,104	31 %	—
Cost per unit sold	0.646	0.662		
Price of unit	1.00	1.00		1.0

¹ This is the number registered at the Company's Office. The actual number is about 15-20 % higher. This discrepancy may be explained by the fact that a great many consumers add lamps or substitute strong ones for weak without informing the Company.

* Are lamps calculated at 500 Watt.

The demand for current increased in 1904 at a much higher rate than was expected. Although the generating station was enlarged last year, it is now working to its full capacity, and at the hours of maximum load, the machines have to work at a slight overload. Next winter the Company will be obliged to erect a new generating set, and consequently to ask permission for raising the capital outlay.

Day consumption also increased during the summer, electric fans being largely employed.

HELWAN.

The supply Company, after having attempted unsuccessfully to get rid of the noise and evil odours in the neighbourhood of the generating station, decided, with the consent of the High Commission, to build a new station outside the town. The new plant will be driven by high-speed steam engines.

Street lighting as before is confined to the existing 200 standards containing two 10 cp. lamps each.

	YEAR ENDING DEC. 31ST.	
	1903	1904
Number of private consumers	77	106
Private lamps connected (10 cp)	3,894	4,675
Units sold to private consumers:—		
(a) On 220 volt circuit KWH	17,400	47,500
(b) To Hotels (100 v. circuit) "	15,000	17,000 (about)
Total... .. KWH	32,400	64,500
Units sold per 10 cp lamp installed KWH	10.2	

MASSOURAH.

The Massourah electric supply Company have increased their generating plant by a 40 KW gas-set, bringing the total capacity to 153 KW.

Public lighting has been increased from 120 to 457 lamps of 16 cp. each.

	ON DECEMBER 31ST.		Increase.
	1903	1904	
Number of private consumers	140	187	32 %
Private lamps connected (10 cp)	4,750	6,150	29 %
Units sold to private consumers KWH	41,170	56,659	38 %
Units sold per 10 cp lamp... ..	8.65	9.2	
Total capacity of generating plant KW	113	153	36 %

SUEZ AND PORT TEWFIK.

In November, 1903, the concession for electric lighting of Suez was transferred from the original concessionnaire, G. Beyts & Co., to the Société Electrique d'Ismaïlia. The whole installation was put down by the Cairo Branch of Siemens Schukort Werke in a very satisfactory manner.

The generating station consists of three 50 H.P. suction gas motors driving 3 alternators of 50 K.W. The motors are from the Lokomotive fabrik Winterthur, Switzerland. Three-phase current of 220 volt is distributed in Suez by overhead wires. The Public Works Department electrical Service recommended the laying of underground cables in certain narrow streets where it was impossible to keep overhead wires at a sufficient distance from the houses. The Company agreed to the proposal and the arrangement has proved quite satisfactory.

To Port Tewfik current is transmitted at high tension by an overhead line across a shallow arm of the Red Sea, and by underground cable where the line follows the public road.

Street lighting consists of 160 25 cp. lamps at Suez and 40 lamps at Port Tewfik. The whole-night lamps are paid for at a rate of L.E. 5 per annum; Half night lamps at L.E. 2 500 mil.

This installation was provisionally taken over in October, and current distributed for the first time on the 15th of the same month.

The following are the figures for the first 2½ months till December 21st, 1904.

Number of consumers	42
Number of private lamps installed	1,404
High tension lines	(a) cable m. 2,576
	(b) overheadm... .. 809
Low tension lines	(a) cable m. 1,379
	(b) overheadm... .. 7,129
Total capacity of plant KW.	90
Units sold to private consumers KWH	4,528

PORT SAID.

The installation carried out by Messrs. Lebon & Co. was completed and provisionally accepted on the 15th of December. The generating station consists of two steam sets of 10 KW, each engine driving two direct current dynamos coupled in series.

The current is distributed on the three-wire system, 2×220 volts with earthed middle wire.

For the present no public lighting is done by electricity.

The price per KW for private consumers is 1.20 fr., against Fr. 1.00 in Cairo.

ISMATIA.

The working of this installation for the first full year has been very satisfactory, consumption having much increased.

A plan for public lighting in the native quarters was drawn up by the electrical Service in June, and an annexe to the general contract was prepared, which has, however, not yet been passed by the local authorities.

Since August, 1904, the Railway station is lighted by 7 arc lamps.

The following are the figures for December 31st, 1904:

Street lighting (paid by Canal Company)	50 lamps of 35 cp.
Number of private consumers	88
Number of lamps connected (10 cp)... ..	2,075
Number of electric motors... ..	4
Power of electric motors	11 HP
Length of overhead lines (3 wires) m.	7,005
" " " " (2 wires) m.	2,276
Total length of lines	9,281
Capacity of generating station Engines	18 KW
" " " " Battery	111 KWH
Units sold (without street lighting)... ..	29,206 KWH
Street lighting	11,259 KWH
Units sold per 10 cp. lamp installed ⁽¹⁾	10.3 KWH

TANTAH.

Supply Company.— Société Electrique de la Basse-Egypte. The Tannah installation started working on September 1st with street lighting only. This consists of 300 lamps of 16 cp at a price of L.E. 2,500 per lamp and per annum.

(1) Arc lamps calculated at 100 watts.

The generating station contains three sets of 40 KW each. The three-phase high tension generators are driven by three 60 HP Crossley suction gas motors. Current is produced at 3,000 volts, and distributed by overhead lines to the transformers. Although protected by guardwires, these high tension lines running through the town have proved very objectionable, and it is advisable to avoid them in future. Even the low tension mains have given rise to complaints, owing to the narrowness of certain streets.

The increase during the first 4 months up to December 31st, 1904, may be seen from the following data :—

Number of private consumers	38
Private lamps connected (10 cp.)	1,066
High tension lines (3,000 volt)... ..	3,500m.
Low tension lines	20,500 m.
Number of transformers street lighting... ..	4
" " private lighting	6
Capacity of generating station... ..	120 KW
Units sold to private consumers	3,078 KWH

The price per unit for private lighting is 3 P.T.

INSTALLATION AT KASR-EL-AINI HOSPITAL.

A complete lighting installation for the Government Hospital, the Medical School and the Sisters home, was carried out under the supervision of the Electrical Service.

1 30 H.P. suction gas plant, supplied by E. Nalman & Co.	
20 KW dynamo supplied by Siemens & Halske.	
Switchboard and mains	" "
Storage battery of 580 amp. hours capacity	" "
ca. 500 incandescent lamps installed by ..	" "

CAIRO SEWER PUMPS.

A 2 H.P. steel wind-motor was erected by this Service at the Sewer Pumping station on the Ismailia Canal with the object of employing a cheaper power than electricity for removing the infiltration and street washing water.

Since September, 1904, this motor has been running, and as shown by the accompanying table, the amount of electricity, compared with last year's figures, has been considerably reduced.

	ELECTRICITY CONSUMPTION.	
	1903	1904
July	—	—
August	36	46 KWH
September	118	20 KWH
October	82	58 ..
November	136	52 ..
December	248	64 ..
Total	620	240 KWH

The wind pump however is unsatisfactory, as the current produced in the sewer by the draw of the pumps is insufficient to prevent silting.

MINOR INSTALLATIONS.

During 1904 the following installations in Government buildings have been executed under the special supervision of the Electrical Service:

Khedivial library	{ 30 incandescent lamps 7 arc lamps
Fire Brigade Station	{ 150 incandescent lamps 2 arc lamps
Mixed Tribunals	{ 110 incandescent lamps 2 arc lamps
Post Office	{ 25 incandescent lamps 11 fans
Sanieh Girls School	{ 300 incandescent lamps 3 Nernst lamps
Ghizeh Printing Office:	5 electric motors of 1 to 3 H.P. each.
Public Works Ministry:	Installation of several lamps in various Departments.
	Exchange of the cold mains for new ones of greater section.

Several Electricity meters in Cairo were controlled at the request of the owners, but in no case was a difference greater than 2% recorded.

The new high tension cables laid by the Gas Company during the year were tested with regard to their installation.

COMPARISON TABLE FOR STREET LIGHTING BY ELECTRICITY IN EGYPT.

Town.	Commence- ment of installation	Number of lamps.	Candle power of lamps.	Lighting hours per year.	Price for one lamp.	Paid per candle- hour (centimes)
					l. s. d.	
Ismailia	1903	50	35	1,850	(Paid for by Canal Co.)	—
Suez	1904	160	25	2,830	3 075	0 137
Port Tewfik	1904	40	25	2,830	4 —	0 146
Helwan..	1902	200	20	1,776	2 025	0 164
Tanta	1904	300	16	2,807	2 500	0 144
Mansourah... ..	1904	460	16	4,060	2 000	0 080

PRICE OF UNIT FOR PRIVATE CONSUMERS IN DIFFERENT TOWNS
OF EGYPT.

Town.	Supply Company	Price per unit (KWH).		
		For Light.		For Power.
		Frcs.	P.T.	
Cairo	{ Compagnie Centrale de l'éclairage par le gaz (Eng. Lebon & Co) ... }	1 00	3 8575	{ Discount up to about 40 %.
Alexandria...		1 00	3 8575	
Port Said ...		1 20	4 63	
Ismailia. ...	{ Société Electrique d'Is- mailia (formerly Groh & Haase) }	1 04	4 00	{ 50 to 70% discount.
Suez		1 295	5 00	
Port Tewfik...		1 43	5 50	
Helwan.. ...	Thos. Cook & Son... ..	1 04	4 00	No power.
Tanta	Société Elect. de la Basse- Egypte (formerly Nahman & Co.)... ..	0 78	3 00	No power.
Mansourah...	Mansourah Elect. Supply Co. (Murdoch & Templeton)...	1 04	4 00	

CAIRO VOIRIE

ROADS.

Total area square metres	2,872,420	
	Sq. M.	% total
Roads well macadamised basalt	551,913	19.
Inferior macadam limestone	882,659	31.
Roads asphalted... ..	36,679	1.3
Earth roads... ..	1,401,249	48.7

SPENT IN UPKEEP.

	Sq. M.	Rate mm.	L.E.
Hand patching	210,100	9.4	2,070
Limestone steam roller repairs... ..	56,594	37.	1,647
Basalt	208,504	30.4	6,596
Basalt reconstruction... ..	71,277	58	3,742
New roads	30,077	73	1,793
Levelling earth roads... ..	504,678	1	511
Total			<u>L.E. 16,359</u>

Naming Streets and numbering Houses.

2,209 street name plates were fixed in 1904, and 3,318 Houses were numbered.

2,734 of the former and 6,613 House plates have been ordered; when these have been fixed, the requirements of the post office will have been met.

GUESIREN GROTTO.

Only L.E. 129 was taken in gate money as against L.E. 155 in 1903.

TRAMWAY.

The important modifications and extensions made at Bab-el-Hadid and the station square affected the position of the tram lines which have been placed so as to interfere as little as possible with carriage traffic.

The double line over Shubra bridge was completed in September.

The total length of the existing network is kil. 16,716.

PLAN OF CAIRO

SHEWING NAMING OF ROADS

- Name places in position
- - - ready to be fixed
- " " on order
- Private roads

Scale 1 : 15,000



Nine fatal, five serious and 91 slight accidents occurred during the year with a traffic of 7,396,417 car kilometres.

By convention with Government the Company are liable for the upkeep of the tramway zone macadam. L.E. 4,058 was paid in 1904 on this head.

RAIN DRAINS.

These drains measure lin. m. 8,055. The total expenditure on pumping, removal of mud, etc., was L.E. 904. About 26,000 c. m. of rain and street water were pumped.

CANAL BULAKIYEH.

This Canal was filled in on a length of 600 metres between the 12th March and 5th July. The cube of earth required was 15,700. Funds were provided by the Finance.

ISMAILIA CANAL ROAD.

The tramway was on the length Bab-el-Hadid, Abu-el-Ela, placed within special kerbs at a cost of L.E. 299. The clear roadway for carriage traffic is now 10 metres.

SALPETRIERE LANDS, FUM-EL-KHALIG.

These lands, which are covered with rubbish heaps, belong to Government and the Water Company in equal parts. When levelled, the value for building will be considerable. 8,000 c. m. of earth were shifted in 1904. New roads were levelled and macadamised at a cost of L.E. 880. The total expenditure in 1904 was L.E. 1,056.

CAB STANDS.

The large cab stand at Ataba-el-Khadra, of an area of 503 sq. metres, was paved with special basalt sets laid in cement, at a cost of L.E. 0,862 per sq. metres.

REMODELLING STORES AT BULAK.

L.E. 751 were spent in 1904.

ASPHALT STREETS.

An area of 13,577 sq. metres was asphalted in the native quarters, vide list, and 3,450 sq. metres in Clot Bey, at a total cost of L.E. 16,734.

Table of Roads asphalted in 1904.

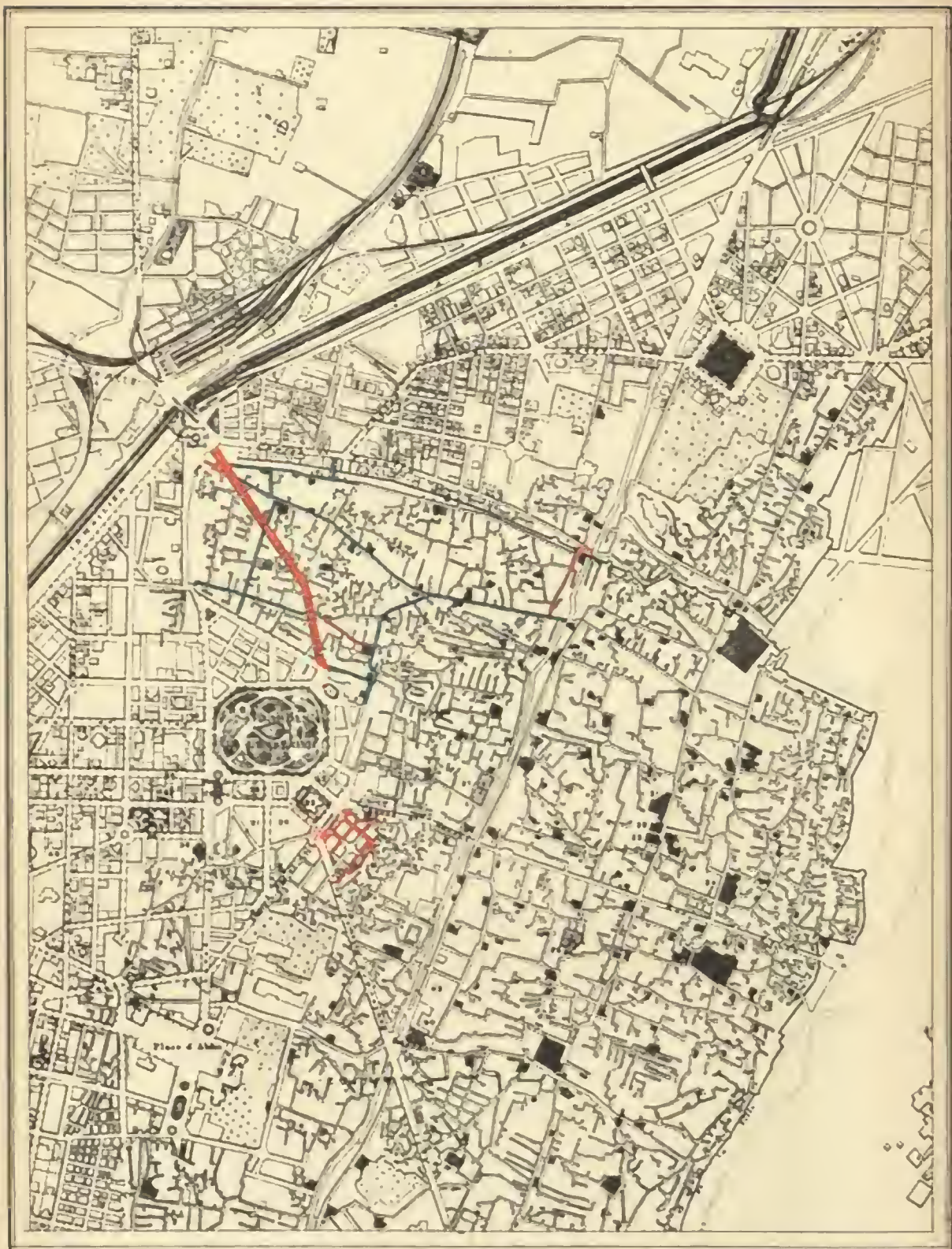
NOMS DES ROUTES.							SURFACE.
							M ²
Route Souk el Guernayali et Zahfurani	...	...	...	...	...	...	1,625.11
" Gameli el Ahmar	...	...	...	...	...	...	895.84
" Fakliry Pacha	...	...	...	...	...	...	763.21
Haret Gameli Azabane	...	...	...	...	...	...	451.48
Route Salama	...	...	...	...	...	...	678.31
Place Salama	...	...	...	...	...	...	311.40
Route el Attar	...	...	...	...	...	...	841.22
" el Morgane	...	...	...	...	...	...	687.82
Haret el Zouhourieh	...	...	...	...	...	...	365.46
Route Souk el Khodra	...	...	...	...	...	...	329.65
Place Ataba el Khadra	...	...	...	...	...	...	1,119.03
Route Fourn Bab el Bahr et Bein el Harat	...	...	...	...	...	...	903.77
" Clot Bey	...	...	...	...	...	...	7811.11
Haret Bab el Bahr	...	...	...	...	...	...	61.79
Attet Chak el Thabane	...	...	...	...	...	...	149.67
Total M ²							17,064.90

1.—Tanzim Rokhsas delivered in 1895-1904.

YEARS.	For buildings and repairs.		For occupation of public roads.		For Verandahs.		Totals.	REMARKS.	
	Cairo.	Koubbeh and Matarieh	Cairo.	Koubbeh and Matarieh	Cairo.	Koubbeh and Matarieh			
1901 ...	2,836	18	430	—	122	—	3,406	2,688	211
1903 ...	2,251	8	166	—	107	—	2,532	1,458	457
1902 ...	2,181	5	123	—	52	—	2,361	1,023	772
1901 ...	2,164	7	98	—	37	—	2,306	1,026	282
1900 ...	2,229	16	90	—	63	—	2,398	1,122	877
1899 ...	2,001	8	117	—	70	—	2,196	1,123	908
1898 ...	2,113	13	85	—	53	—	2,261	1,001	761
1897 ...	1,639	114	165	—	59	—	1,977	1,272	017
1896 ...	1,690	101	129	—	46	3	2,181	1,036	462
1895 ...	1,703	12	107	—	18	—	1,840	957	661

PLAN OF CAIRO

SHIEWING ROADS ASPHALTED



—— Roads asphalted in 1903. Cab-stand, basalt paved
—— " " " 1904 with rain water drain.

Scale 1 : 18,000



B.—Expropriation and Sale of Ziadet Tanzim.

YEARS.	EXPROPRIATIONS.					ZIADETS SOLD.				
	Areas.		Sums paid.		Price of M ² .	Areas.		Sums received.		Price of M ² .
	M ²		L.E.	M.		M ²		L.E.	M.	
1904 ...	1,852.60		1,279	779	0 694	753.13		829	560	1 101
1903 ...	1,696.24		1,106	815	0 652	1,252.36		923	361	0 737
1902 ...	1,566.30		999	452	0 638	685.47		401	528	0 586
1901 ...	2,186.63		1,604	386	0 731	1,831.83		895	856	0 188
1900 ...	1,211.25		742	424	0 613	761.33		342	800	0 450
Period before										
1900 ...	179.27		1,792	700	10 000	—		—		—
1899 ...	1,553.81		1,104	638	0 711	3,853.22		1,209	440	0 314
1898 ...	1,382.76		1,324	135	0 958	1,295.95		509	967	0 393
1897 ...	705.98		292	114	0 414	367.42		130	486	0 355
1896 ...	196.119		488	677	0 985	702.449		302	053	0 420
1895 ...	1,008.92		1,329	268	1 210	517.765		454	159	0 877

C.—Contraventions, Demolition Orders & Verification of Permits.

YEAR.	CONTRAVENTIONS.		DEMOLITION ORDERS.				VERIFICATION.	
	Cairo.	Abbasieh and Matarieh.	Orders made.		Orders executed.		Cairo.	Abbasieh and Matarieh.
			Cairo.	Abbasieh and Matarieh.	Cairo.	Abbasieh and Matarieh.		
1904 ...	439	—	375	—	280	—	102	—
1903 ...	283	—	273	—	132	—	50	—
1902 ...	186	—	200	—	97	—	83	—
1901 ...	156	—	286	—	84	—	64	—
1900 ...	167	1	217	—	61	—	210	—
1899 ...	150	5	243	—	133	—	249	—
1898 ...	176	5	270	9	153	—	240	27
1897 ...	253	22	245	1	90	—	150	—
1896 ...	286	12	229	—	51	—	7	18
1895 ...	548	—	535	—	274	—	665	—

	PARTIAL AREA OF ROADS IN								DIFFERENT KINDS OF PAVING						Total area of Roads in different systems of paving.	Total area of earth Roads.	Total area of Cairo Roads.
	LIME STONE ROADS					BASALT		ROADS		Roads in compressed & Briquettes Asphalt							
	Bad Roads, old system	New limestone Roads.			Totals of old roads in bad macadam	Bad Roads, old system recon- structed in basalt.	Previously in earth recon- structed in basalt.	Newly made in basalt.	Total	Previously in macadam and recon- structed in com- pressed asphalt.	Previously in earth and recon- structed in com- pressed asphalt.	In asphalt recon- pressed briquettes.	Total.				
		Previously in earth	Newly made.	Total													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	
To end of December, 1903	778,145	89,255	80,193	169,728	307,873	450,290	147	13,950	470,387	1,008	13,954	4,082	19,944	1,437,901	1,406,600	2,844,415	
In 1904	701,581	164	19,820	20,250	—	71,277	1,006	8,181	81,061	13,845	3,190	—	17,035	33,267	5,290	—	
		89,099	100,319	190,018		527,567			551,451	17,035							
						11,558			562,993								
Deduct roads remade in Basalt	—	190	11,830	12,020	—	—	—	—	—	—	—	—	—	—	—	—	
Add limestone roads remade in Basalt	—	—	—	—	—	—	190	11,830	12,020	—	—	—	—	—	—	—	
Add newly made Roads (Cols. III and VIII)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28,067	
Total to 31st December, 1904	701,581	89,509	88,489	177,998	382,573	519,009	1,915	30,961	551,913	15,453	17,141	4,082	36,676	1,471,171	1,411,240	2,882,410	
										32,597							
Percentage	24.5	3.1	3.1	6.2	20.7	17.9	0.1	1.2	19.2	0.5	0.6	0.2	1.3	51.2	48.8	100	

P.—Repairs by Hand-Labour.

Year.	Area required	Material.			Labourers.		Sakkas and fantass water carriers.		Carts.		Total Suma.
		Stone.	Sand.	Water.	Days.	Sum.	Days.	Sum.	Days.	Sum.	
1904	210,100	7,455	2,076	2,242	1,012	380	2,550	137	2,527	341	2,070
		9,531									
1903	218,052	7,917	2,134	2,494	1,118	613	2,887	156	3,127	421	2,338
		10,051									

P.

REPAIRS PER HAND-LABOUR.		1904.	1903.
1.	Depth stone per square metre	7,455; 210,100 = 0.035	0.032
2.	Proportion of sand per cubic metre of stone	2,076; 7,455 = 0.278	0.270
3.	Cube of water used per cubic metre of stone	2,242; 7,455 = 0.301	0.315
4.	Cube of water used per square metre repaired	2,242; 210,100 = 0.011	0.010
5.	Mean surface repaired per day of workman	210,100; 11,290 = 18.61	19.77
6.	Mean surface watered per day of fantass... ..	210,100; 2,550 = 82.39	85.92
7.	Mean cube transported per day of cart	9,531; 2,527 = 3.771	3.214
8.	Load of cart per journey	24; 7,512 = 3.182	3.515
9.	Cost price of materials per square metre repaired... ..	1,012; 210,100 = 0.0048	0.0045
10.	" per labourer... ..	580; 210,100 = 0.0028	0.0026
11.	" per sakkas and fantass	137; 210,100 = 0.0007	0.0006
12.	" per cart... ..	311; 210,100 = 0.0015	0.0017
13.	Total cost price	2,070; 210,100 = 0.0099	0.0094

6.—Percentage Table.

YEAR.	LABOUR.				Cost price per m ² .
	Material, stone, sand, water %	Men %	Sakkas & Fantass %	Carts %	
1904 ...	48.9	28.0	6.6	16.5	L.L. M.
1903 ...	47.8	27.5	6.7	18.0	0.00933
					0.00944

11.—Steam Roller Repairs.

YEAR.	Repaired area.	Material.			Labour.		Fantass.		Carts.		Steam Roller.		TOTAL amount
		Stone.	Sand.	Water.	Days.	Sum.	Days.	Sum.	Days.	Sum.	Days.	Sum.	
1904 ...	56,560	4,195	656	2,040	6,254	827	205	46	1,470	201	163	187	1,647
		4,851											
1903 ...	26,170	3,022	386	886	2,765	543	138	19	1,005	181	70	94	963
		3,408											

1. Depth stone per square metre ...	1904	1.195	56,560 =	0.074
2. Proportion of sand per cubic metre of stone ...		636	4,195 =	0.156
3. Cube of water used per cubic metre of stone ...		2,040	4,195 =	0.486
4. Cube of water used per square metre repaired ...		2,040	56,560 =	0.036
5. Mean surface repaired per day of workman ...		56,560	6,254 =	9.04
6. Mean surface watered per day of fantass ...		56,560	205 =	185.44
7. Mean cubic transported per day of cart ...		4,851	1,470 =	3.345
8. Load of cart per journey ...		24	6,691 =	2.787
9. Mean surface rolled per day of steam roller ...		56,560	163 =	346.99
10. Total mean cost price of rolling ...		187	56,560 =	0.0033
11. Total mean cost price per square metre of repairs.		1,647	56,560 =	0.029

J.—Basalt Repairs.

Year	Area repaired.	Material				Men		Haulage		Carts		Steam rollers.		Kilometers done		Total Amount.
		Stone.	Ballast.	Water.	Sum.	Days	Sum.	Days	Sum.	Days	Sum.	Days	Sum	(per M ² of road)	(per M ² of material).	
		C.M.	C.M.	C.M.	L.F.		L.F.		L.F.		L.F.		L.F.		L.F.	
1901	208,504	15,111	2,094	8,216	3,037	28,170	1,706	1,200	174	5,741	825	637	854	1435	14025	6,596
1903	171,803	14,517	1,735	6,691	2,341	21,555	1,292	880	123	5,173	769	565	692	0886	9882	5,220
1903																
1901.																
1. Depth stone, per M ²																
2. Proportion of material of various regions per M ² of stone																
3. Cube of water used per M ² of stone																
4. Cube of water used per M ² required																
5. Mean surface water per day of workman																
6. Mean cube transported per day of cart																
7. Mean cube transported per day of cart																
8. Load of cart per journey																
9. Mean surface rolled per day of steam roller																
10. Mean cost price of rolling																
11. Total mean cost price per M ² required																
15,111: 208,054 = 0073																
2,094: 15,111 = 0138																
8,216: 15,111 = 0544																
8,216: 208,054 = 0039																
208,054: 28,170 = 739																
208,054: 1,200 = 17338																
17,205: 5,741 = 2997																
24: 5,991 = 4004																
208,054: 367 = 566																
854: 208,054 = 00041																
6,596: 208,054 = 00317																

K.—Percentage Table.

YEAR.	Material, stone, water, binding	LABOR.					Steam roller %	Cost price per M ²
		Men. %	Families %	Carts		Total %		
				%	%			
1901	460	25.9	2.6	12.5	41.0	13.0	00317	
1903	419	24.7	2.4	14.7	41.8	13.3	00301	

1.—Roads reconstructed in Basalt.

YEAR.	Area.	Material.			Work performed by carts.						Fountain.		Water.		Labour and inspection.		Roller.		Total expenditure.			
		Basalt.	Old stone.	Binding.	Amount.	Materials transported.			Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.				
						Earth or old stone.	Binding.	Total.														
1901...	71,277	6,808 0.246	726	1,684	1,280	6,808 0.246	1,484	726	9,014	4,406	724	573	80	1,213	34	12,983	784	100	38	1,193	7,593	3,742
1902...	81,597	9,397 1.258	314	1,739	2,264	9,397 1.258	1,729	314	12,078	5,005	1,023	587	82	4,314	35	15,243	875	62	317	1,419	8,132	4,764

* Days.

		1901		1902	
1.	Depth stone per M ² ...	8,130	71,277 = 0.111	0.134	1901
2.	Proportion of binding per M ² of stone ...	1,484	8,130 = 0.182	0.161	1901
3.	Cube of water used per M ² of stone ...	1,213	8,130 = 0.151	0.356	1902
4.	Cube of water used per M ² of road ...	4,213	71,277 = 0.059	0.033	1901
5.	Mean surface per day of labourer ...	71,277	12,986 = 5.49	3.35	1901
6.	Mean surface watered per day of fountain ...	71,277	573 = 124.39	120.01	1901
7.	Mean cube transported ...	9,611	4,406 = 2.152	2.488	1901
8.	Load of cart per journey ...	91	4,301 = 0.577	1.821	1901
9.	Mean surface rolled per day ...	71,277	291 = 244.91	235.15	1901
10.	Mean cost price material per M ² ...	1,500	71,277 = 0.0222	0.0278	1901
11.	" " workmen ...	784	71,277 = 0.0110	0.0167	1901
12.	" " carts ...	723	71,277 = 0.0108	0.0125	1901
13.	" " fountain and water ...	114	71,277 = 0.0016	0.0014	1901
14.	" " sundry purchases ...	109	71,277 = 0.0015	0.0007	1901
15.	" " roller ...	382	71,277 = 0.0054	0.0052	1901
16.	Total mean cost price ...	3,742	71,277 = 0.052	0.058	1901

N.—New Roads Rolled by Steam Roller.

YEAR.	Area.	Material.			Labour.		Faints.		Cuts.		Roller.		Total Amount.
		Stone.	Sand.	Water.	Days.	Amount. L.R.	Days.	Amount. L.R.	Days.	Amount. L.R.	Phys.	Amount. L.R.	
1904 ...	30,077	5,278	872	1,997	4,894	297	267	49	1,330	214	130	129	1,793
1903 ...	23,615	4,836	652	1,475	4,747	277	196	27	1,561	234	131	133	1,723

							1904		1903
1. Mean depth stone per square metre	...	...	...	...	...	...	5,278; 30,077 =	0.175	0.210
2. Proportion of sand per cubic metre of stone	...	...	...	...	...	...	872; 5,278 =	0.165	0.130
3. Cubes of water used per cubic metre of stone	...	...	...	...	...	...	1,997; 5,278 =	0.378	0.305
4. Cubes of water used per square metre of road	...	...	...	...	...	...	1,997; 30,077 =	0.066	0.062
5. Mean surface per day of workman	...	...	...	...	...	...	30,077; 4,894 =	6.15	4.97
6. Mean surface watered per day of faints	...	...	...	...	...	...	30,077; 267 =	112.65	120.48
7. Mean cubes transported per day of cart...	...	...	...	...	...	...	6,150; 1,330 =	4.624	3.528
8. Load of cart per journey	...	...	...	...	...	...	24; 9,248 =	2.595	3.423
9. Mean surface rolled per day of steam roller	...	...	...	...	...	...	30,077; 130 =	231.36	180.26
10. Mean cost price per roller	...	...	...	...	...	...	129; 30,077 =	0.0042	0.0056
11. Total cost price per square metre	...	...	...	...	...	...	1,733; 30,077 =	0.0536	0.073

1'.—Levelling of Earth Roads and Footpaths.

Year.	Levelling.		Working days.		Cart days.		Days watering by hand.		Cube of earth.		Amounts.	
	Roads.	Footpaths.	Roads.	Footpaths.	Roads.	Footpaths.	Roads.	Footpaths.	Brought.	Transported.	Roads.	Footpaths.
1904... ..	307,071	197,407	3,553	1,971	459	279	10	100	1,881	2,626	308	203
	504,678		5,524		738		110		4,507		511	
1905... ..	424,022	65,035	4,275	323	547	119	56	10	2,129	3,284	392	43
	489,117		4,598		666		65		5,413		435	

Public Gardens.

[illegible]

Children and Spence.

<i>Gardens and Squares.</i>		1901	1903
Area per workman per day	...	96.715 = 13.01	11.73
Cost price per M ² by labour, guards and inspection	...	(108 + 90 + 320 + 42) = 367.12 = 0.0066	0.0060
Cost price per day of cart	...	72 = 96.715 = 0.0008	0.0011
Cost price per plants and supplies	...	182 = 96.715 = 0.0019	0.0020
Total cost price per M ²	...	897 = 96.715 = 0.0023	0.0024
Gals of water used per M ² per annum	...	67,880. 51,700 = 13.13	1.363
Cost when watering per M ² per annum	...	1,313 × 0.008 = 0.0105	0.0109
Total cost price per M ² including watering	...	0.0023 + 0.0105 = 0.0128	0.0029

S.—Sand and Stone Quarries.

MATERIAL.	Tourah and Old Cairo.	Abbasieh.	Abou Zaabal.	Total.
	M ³	M ³	M ³	M ³
1904				
Road metal	6,865	6,129	20,122	33,116
Sand	—	7,955	—	7,955
1903				
Road metal	3,197	8,624	21,827	33,648
Sand	—	12,220	—	12,220

PLAN OF CAIRO

SHEWING ROAD METAL 1904.

Basalt repaired

untouched

— "relaid"

.....Limestone repaired

11

Scale 1 : 18.000

[illegible]



RODA BRIDGE.

Tenders for the adjudication advertised in 1903 were opened on the 1st February. Thirteen offers, comprising a total of 34 different projects, were sent in. Of these, 5 were French, 2 Belgian, 1 German, 1 Swiss and 4 English. Our original estimate for the bridge proper was L.E. 177,290.

Three of the 4 tenders retained for final comparison were below this figure, but in consequence of the advantages offered by Messrs. Arrol, as regards the cantilever design, greater facilities for the passage of boat, and extra weight of metal, it was decided to accept their tender although it exceeded our estimate by L.E. 5,673.

Each of the 34 schemes had to be examined and reported on in great detail, and the fact that this laborious undertaking, necessitating constant night-work, was completed in two months, reflects the greatest credit on Mr. Reboul and the following members of the staff.

Mr. Zarzecky,
" Schoechlin,
" Ricordi,
" Ahmed Omar.

M. Zarzecky, whose services it is difficult to overrate, unfortunately died of pneumonia acquired in the execution of his duty.

In the person of M. Schoechlin, who has resigned, Government has lost a talented and hard-working officer.

The official date for commencing operations was fixed for the 1st December, 1904.

The contractors, however, utilised the period elapsing between August and the 1st December to erect a length of 47 metres of staging on the Roda side, and 252 metres on the Gizeh side. This work represents the driving of about 302 piles 0·33 metres sq. and from 10 to 22 metres in length.

Expropriation Roda.—The cost per feddan was estimated at L.E. 1,000 or 24 P.T. a square metre. Thanks to the skilful manner in which Mr. Reboul carried out the difficult and delicate negotiations with the owners, the actual price paid was L.E. 300 per feddan or about 7 P.T. the M².

The total area expropriated in 1904 was 14 feddans 8 kir. 1 sch. (60,220 sq. m.) The economy effected on the first estimate being L.E. 10,033.

On the Cairo side the greatest difficulty was experienced in acquiring from the owner the land necessary for widening the North bridge approaches. We were finally obliged to pay L.E. 2 per sq. m. This represents an excess on our estimate of L.E. 1,319.

Filling and raising level Roda Avenue.—Spoil for this filling is being taken from the Old Cairo mounds, and the contract was given to the Delta Light Railway at 3 P.T. per c.m.

A 0.74 gauge line has been laid, and the dumping trucks are drawn by a 10 ton locomotive.

The cross-road joining the Main and South subsidiary bridges has reached a mean level of about RL 22 the finished RL being 25.

The North to South Central road was begun on the 18th November. 20,000 c.m. have been dumped. A cube of 50,000, against a required total of 220,000, was completed in 1904. An economy on the estimate of about L.E. 1,400 may be expected on this item. On the advice of Sir B. Baker and Colonel Western the limits of stress of metal originally specified were modified to bring them into conformity with the standard Committee's specification. The differences are shown hereafter.

REVISED ESTIMATES

	L.E.	L.E.
Preliminary Surveys	1,110	
Land, January 1904	3,750	
Land during 1904... ..	1,750	9,610
Earthwork roads	7,000	
Temporary bridge... ..	1,500	
Staff preliminary	1,000	9,500
Macadam roads	5,000	
Kerbs	3,000	
Trees and shrubs	500	
Retaining walls	500	
Staff during work... ..	1,500	13,600
Arrol's estimate three bridges	182,963	182,963
15 % unforeseen on... ..	<div> <div>9,500</div> <div>13,600</div> <div>182,963</div> </div>	
	206,063... ..	—
		30,909
		246,582
London Agent's Commission and sundries	—	3,118
Total... ..	—	250,000

Quality Steel.	Ultimate Tensile strength. Kilos. per sq. m./in.	Elastic limit. Kilos. per sq. m./in.	% Elongation on			Contraction at point of rupture %
			8"	2"	6"	
<i>Original.</i>						
Steel plates	42—50	25—33	18—25	—	—	40—50
Cast steel..	50—60	28—36	—	—	13—20	30—40
Rivets	34—38	22—28	28	—	—	60
<i>New.</i>						
Siemens Martin open hearth acid plates ...	44·1 50·4	—	20	—	—	—
Cast steel... ..	42·5 50·1	—	—	16	13	—
Rivets	41 47·3	—	25	—	—	—
W. I. { with grain ...	34·7	—	8	—	—	—
{ across grain ...	28·4	—	—	—	—	—
bolts and nuts.	36·2	—	15	—	—	—

**Désignation des travaux faits pendant l'année 1904
au Bureau d'Architecture.**

Projet d'une fontaine lumineuse au Jardin de l'Ezbekieh.
Projet complet d'un « Croquet house » à Ghézirah (exécuté et dirige les travaux).
Projet complet d'un « Bungalow » pour M. A. Colombo à Zohrieh Garden (exécuté et dirigé les travaux).
Esquisse rez-de-chaussée « Type Markaz et Caserne de Police ».
Profil des routes par où passent les tramways du Caire.
Vérification de la pression sur les joints de rupture pour « Proposed adaptation of existing reservoirs for sand-filters ».
Projet Kasr-el-Nil Barracks.
Projet « Kiosque pour deux boabs ».
Devis pour « Tender for Helwan filter plant ».
Dix-sept dessins pour les nouveaux ponts de Rodah.
Vérification du projet et de l'offre de M. Palanca pour un caracol indigène à Port-Saïd : nouveaux devis.
Dessin « Proposed Installation of Jewel filters for Helwan ».
Plan à l'échelle de $\frac{1}{500}$ du projet pour le percement d'un boulevard entre la place Kantarut-el-Dekkah et Fagallah.
Carte de la Basse-Egypte.
Dix dessins de nouveaux boulevards au Caire.
Dessin du « Bassin eaux de Ghizah ».
Divers dessins pour « Alexandria new British Consulate ».
Dessin de la coupe transversale M N du Musée Egyptien.
Dessin « Blocage en aval du pont de Kasr-el-Nil ».
Plan d'emplacement de l'ancien lac du Jardin de l'Ezbekieh.
Plan de la Ville et du Port de Port-Saïd.
Divers dessins « Hôpital des Aliénés ».
Avant projet « Agrandissement du théâtre Jardin de l'Ezbekieh ».
Devis estimatif « Quarantine Office » à Alexandrie.
Théâtre Khédivial de l'Opéra. Avant-projet pour la reconstruction du théâtre ; rapport.

A ces travaux il faut ajouter les divers dessins et calques qui ont été demandés par la Direction Générale, MM. les Inspecteurs, le Service Administratif et les travaux du Bureau, dont les détails ci-après.

Divers dessins et calques.

Parc Quarantenaire du Mex : bergeries, hangars.
Passage supérieur du Pont de Choubra.
Carte des Inspections Nord-Est-Ouest.
Lignes des Tramways du Caire.
Maison écroulée à Bab-el-Charieh.
Relevé des écuries existantes à Zohrieh Garden.
Plan Assint Akmar.
Plan Hydrographique des Carrières d'Abou-Zanbal.
Plan de Khartoum et voisinages.
Terrains de l'usine de Boulak (Compagnie des Eaux).
Courbes du Nil d'après le Nilomètre de Rodah.
Croquis du projet du nouveau pont de Rodah.
Tramway de Port-Saïd : prolongement demandé de la ligne des Cimetières.
Plan de Sawakin.
Plan de Sheikh-el-Barghout.
Projet de transformation de Charieh Terak-el-Ismaïlia.
Key plan of lines to Cairo Quarries.
Terrain S. A. le Prince Mohamed Ali Pacha à Rodah.
Ras-el-Tin, Plan d'ensemble du terrain et de l'ancien et nouveau Palais
Khedivial à construire.
Agrandissement à l'échelle de $\frac{1}{250}$ d'une partie des terrains de Ghizeh.
Quai avec puits entre le pont des Anglais et le nouveau pont de Ghizeh.
Croquis de motor-cars.
Croquis nouveau Boulevard Abbas.
Plan du Palais d'Ismaïlia.
Bulletins pour tirage Photocopique n° 1015.

ATELIER DE PHOTOCOPIE

État du 1^{er} Décembre 1903 au 30 Novembre 1904.

DATE	COMMANDES		DATE	CONSOMMATION		COPIES	
	Positif	Négatif		Positif	Négatif	Positif	Négatif
	M ^r	M ^r		M ^r	M ^r	N ^o	N ^o
Solde au							
1 ^{er} - 12 Déc. 1903.	555.11	760.79	Décembre 1904.	168.79	17.24	498	50
25 Janvier 1904.	—	1,000 —	Janvier 1905	309.91	1,426.08	615	1,787
10 Février... »	500 —	—	Février ... »	162.99	127.99	336	360
11 Mars ... »	—	1,000 —	Mars... ... »	239.94	247.07	597	333
16 Avril ... »	500 —	—	Avril ... »	587.01	191.00	1,097	288
24 Mai... ... »	500 —	—	Mai »	480.11	356.51	995	439
13 Juin ... »	500 —	—	Juin... ... »	554.02	84.37	931	316
9 Juillet ... »	500 —	—	Juillet ... »	237.69	99.39	526	155
5 Sept. ... »	500 —	—	Août... ... »	282.19	75.45	488	118
26 Oct. ... »	—	1,000 —	Sept... ... »	283.80	31.78	379	122
31 ... » ... »	500 —	—	Octobre ... »	600.51	1,116.87	1,128	1,329
19 Nov. ... »	—	1,000 —	Nov. »	1,636.39	235.41	2,821	326
21 ... » ... »	500 —	—					
1 ^{er} Déc. ... »	500 —	—		5,543.38	1,009.16	10,411	5,623
14 ... » ... »	500 —	—	Solde au				
			1 ^{er} - 12 Déc. 1905.	11.73	751.63		
	5,555.11	4,760.79		5,555.11	4,760.79		

Exécuté 10,411 copies positives

» 5,623 » négatives

Total général 16,034 exécuté 1904.

ATELIER DE PHOTOGRAPHIE

Travaux exécutés pendant l'année 1904.

	Clichés.	Copies.
	N°	N°
Vue du Nil ; emplacement du Pont de Rodah... ..	12	12
Reproduction de l'esquisse d'un pont de 535 m. sur le Nil (Direction Générale des Villes et Bâtimens)... ..	5	10
Reproduction des projets présentés au concours pour le pont de Rodah	50	200
Lady Cromer Memorial	2	4
Maison du Directeur de l'Hôpital Kasr-el-Eini et station de désinfection	2	4
Caserne des pompiers	4	8
Monument à Mariette Pacha	4	20
Inauguration du monument à Mariette Pacha	3	15
Rochers de la Citadelle (pour l'Inspection Bâtimens du Nord	—	50
Excavation Ecole Khédiviale de Droit	—	16
Pilastres couloirs des cours Ministère des Travaux Publies	8	32
Ecole Khédiviale de Droit	6	12
Total ...	96	387

Soit :

N° 96 plaques.

N° 387 épreuves photographiques.

ATELIER DE VÉLOCIGRAPHIE

État des travaux exécutés pour les divers Services pendant l'année 1904

COMMANDES				CONSOMMATION		
Date de la commande	Quantité	Prix unitaire	Prix total	Désignation des Services	Nombre des pages	Totaux des tirages
27 janvier 1904...	6	0,75	4,500	Bâtiments spéciaux du Nord du 5 novembre 1903 au 15 novembre 1904 ...	1,373	16,763
29 mars 1904...	6	0,75	4,500	Bâtiments spéciaux du Sud du 5 novembre 1903 au 15 novembre 1904 ...	791	13,280
4 juin 1904...	6	0,75	4,500	Inspection du Sud du 5 novembre 1903 au 15 novembre 1904 ...	292	2,947
16 août 1904...	6	0,75	4,500	Bureau Central de la Comptabilité du 5 novembre 1903 au 15 novembre 1904 ...	226	5,235
4 novem. 1904...	6	0,75	4,500	Bureau d'Architecture du 5 novembre 1903 au 15 novembre 1907... ..	152	912
				M. Richmond Inspecteur en Chef du 5 novembre 1903 au 15 novembre 1904.....	137	1,647
				Pour tous les Services du 5 novembre 1903 au 11 novembre 1904 :		
Total des dépenses L. E.			22,500	Total		2,971 40,784

Ce qui fait $\frac{22,500}{40,784} = 0,00055$, soit 0,055 pour les 100 tirages.

REPORT ON THE SURVEY DEPARTMENT

For 1904

BY

CAPT. H. G. LYONS,

DIRECTOR-GENERAL, SURVEY DEPARTMENT.

THE SURVEY DEPARTMENT REPORT, 1904.

REVENUE SURVEY.

The work of the past year has been mainly concentrated on the Revenue Survey. Since the lands of Aswan, Qena and Girga Mudirias are inundated by the flood, field-work can only be done and complaints investigated during the period December to July. Moreover, the date by which work in any province was to be completed was advanced three months by the Finance Ministry, bringing it to the end of the flood season, so that all investigation in the field had to be finished before the flood, which was equivalent to advancing the date about six months. This change greatly increased the pressure of work on all branches of the Department.

The increased cost of this accelerated rate of work absorbed much of the funds which would otherwise have been available for topographical and town survey work, which consequently has fallen into arrears although the Irrigation service contributed a certain sum to prevent the preparation of the 1:60,000 maps being altogether stopped.

The sales of maps have steadily increased.

YEAR.	Printed maps.	Publications.	Tracings.	Total.
	L.E.	L.E.	L.E.	L.E.
1901	215	49	537	801
1902	292	90	629	1,011
1903	875	122	724	1,721
1904	1,733	166	910	2,809

The Map Store is being enlarged and a sale room must be built where applicants can consult maps and purchase them.

STATEMENT OF PRINTED MAPS, ETC., IN MAP STORE.

	Maps	Publications including meteorological monthly sheets
In Store 1st January, 1901... ..	403,276	133,251
Received during 1901... ..	228,097	46,875
Issued during 1901... ..	122,362	38,921
In Store 31st December, 1901... ..	509,011	141,205

The issue has largely increased, showing that a fuller use is being made of maps, both by Government Departments and by the public.

ISSUES.

YEAR.	MAPS.		PUBLICATIONS.	
	Free (1)	On payment	Free (2)	On payment
1901... ..	24,550	2,847	9,009	235
1902... ..	88,086	4,137	15,847	801
1903... ..	122,817	13,071	30,901	1,618
1904... ..	99,083	23,279	37,610	1,311

The library of the Department has grown considerably and is of the greatest use to Inspectors.

	Books and Pamphlets	Maps.
In the Library 1st January, 1904... ..	3,191	784
Purchased... ..	315	15
Presented... ..	463	4
In the Library 31st December, 1904... ..	3,969	803

(1) To Government Departments.

(2) Mostly monthly meteorological observations sent to Government Departments and to other Services and Observatories.

I deeply regret to record the death of late Captain C.H. Wood on October 24, 1904; he had been an inspector in this Department since January 1, 1903; of exceptional ability and great tact in dealing with all with whom his work brought him into contact, he had, during the short time that he was in the Department, greatly improved the work of his own section, and I am indebted to him for many suggestions and improvements in the work and organisation of various branches of survey.

At the commencement of 1904 the whole of the Revenue Survey Staff was working in the Mudirias of Aswan and Qena. On January 1st, 1904, 218,000 feddans of Qena Mudiria had already been surveyed in the field, and there remained 181,500 feddans to be taken up, with the whole of Aswan Mudiria, i.e., 101,000 feddans, making a total of 282,500 feddans, which area was completed in maps and records before the end of 1904.

In Girga Mudiria, 294,000 feddans were surveyed in the field, and 10,000 feddans were completed in records before the end of the year.

Thus there were 218,000 feddans brought forward from 1903, and 294,000 carried forward into 1905. The mean of these figures gives 256,000 feddans, which, with the 282,500 feddans commenced and completed during the year, gives a total area of 538,500 feddans completed during 1904.

This figure is considerably lower than that of 1903, but the smaller area is due to conditions met with in Nubia and Upper Egypt, which differ greatly from those in Lower Egypt.

The total number of villages completed in maps and records during the year is as follows:—

Qena Mudiria	133
Aswan Mudiria	74
Girga Mudiria	12
Total	<u>219</u>

It is proposed to complete the Mudirias of Girga and Assiut during 1905, i.e., an area of about 800,000 feddans, and also to take up as much as possible of Minia Mudiria. As this area exceeds by about 100,000 feddans any area hitherto surveyed during one year by the Revenue Survey, it has been found advisable to increase the staff of messahin from 204 to 230, and the staff of engineers from 36 to 44.

During 1904 the theodolite traverse completed all the villages in Girga Mudiria, and 184 villages in Assiut Mudiria were sent in for

computation by the end of the year; also one markaz in Minia Mudiria was taken up.

There were 135 men admitted to the Instruction Class during 1904, of whom 34 were dismissed during their course as unsuitable, and 101 were trained and distributed among the taftishes.

The wastage of messahin during the year was 44 men, of whom 31 were promoted to engineers, 17 resigned rather than work in Upper Egypt, 13 were dismissed and one died.

TRIANGULATION.

During the year major triangulation has been carried on by two parties who have completed part of Aswan, all Assiut, Minia and Beni Suef. For the purposes of the general maps the line of triangulation has been joined to that of the Fayum, and will be carried down through Giza to join the Qaliubia-Daqahlia work. The reconnaissance of this part has been completed, and by the end of March, 1905, the angles will be observed. By that date it will be possible to base a general map of Egypt on a long triangulation extending from Wadi-Halfa to Danielta. The triangulation depends on ten bases, roughly at intervals of one hundred kilometres, and its absolute position depends on two fundamental latitudes and longitudes at Abbassia and Luxor, and on check astronomical observations at the other base-lines, with the exception of that of Fashu.

The Assiut triangulation was the most satisfactory part yet done. The error of closure of triangles averaged 2'. The bases at each end, at Roda and Tema respectively, which were measured with different apparatus, have probable errors of 1/1,600,000 and 1/190,000 respectively. Further, when the Roda base was computed by triangulation from Tema base, the difference between the measured length and that computed was 0.028 metre.

STATISTICAL DETAILS.

Major Triangulation.

	Aswan.	Assiut.	Minia.	Beni-Suef.	Giza Reconnais- sance only.
Extent in square km.	175	2,003	1,802	970	—
Time taken in days	51	152	148	92	15
Stations occupied	8	19	27	10	—
Lines observed	16	41	63	21	—
Triangles	6	32	27	11	—
Average length of side kms. ...	17	22	15	24	—
Cost L. E.	181	815	885	256	35
Cost per square km. L. E. ...	1.034	0.407	0.422	0.264	—
Cost per station L. E.	25.2	42.9	32.3	25.6	—
Average error of closure of trian- gles	2".48	2".04	2".02	2".40	—

Minor Triangulation.

As last year four parties were at work in Aswan, Assiut and Minia throughout the greater part of the year, during summer, when the heat made accurate theodolite work very difficult in Upper Egypt, three of these parties were transferred to the Delta, since up to the present no trustworthy triangulation had been made connecting the two branches of the Nile.

The total cost was :—

	L. E.
Personnel	1,634
Transport	368
Marks	70
Total	2,072

For this sum an extent of 4,430 square kilometres was triangulated.

STATISTICAL DETAILS.

	Aswan.	Assiut.	Minia.	Dahia.
Extent in square km.	750	1,950	930	800
Time taken (days)	95	433	282	120
Stations occupied	54	227	85	64
Lines observed	150	758	265	186
Triangles	50	379	120	60
Average area in sq. kilom.	10	5.6	5.2	8
Average length of sides, kilom. ...	6	4.1	3.2	5
Cost L.E.	205	938	603	326
Cost per sq. kilom L.E.	0.291	0.419	0.647	0.408
Average error of closure of triangles	2".5	2".6	2".8	2".4

COMPUTATION.

The work of computation has proceeded on the lines of the previous year. Further attention has been given to the final checking of all work in the office.

STATISTICS OF TRAVERSE COMPUTATION.

	1901.	1902.	1903.	1904.
Points computed	13,000	53,136	31,980	53,942
Length of lines computed ... Kilom.	—	12,112	9,600	13,686
Sheets plotted	2,300	5,026	4,968	6,400
Area computed Fedd.	—	875,041	714,132	652,977
Villages computed	—	540	302	423
Total cost L.E.	—	2,079	2,366	2,325
Cost per feddan "/m	—	2.38	3.22	3.56
Points for Topographical and Town Surveys	—	—	2,000	2,100

The area computed is less than last year, but this is largely due to the fact that Aswan, though of small size, involves a greater density of traverse points, and consequently increased computation. It is estimated that the actual computation in this mudiria has been equivalent to the usual computation for a province of twice the size.

Meteorological Stations.

A new station was equipped at Roseires, and by arrangement with the Sudan Government several climatological stations will be brought up to the level of the second order. A beginning was made with el Obeid, where a barometer was established in December.

The Annual Report for 1902 was published during the year, and that for 1903 sent to the press. By 1905 the arrears in publication will be cleared off.

MAP PUBLICATION.

The output of Revenue Survey map sheets has been less than in 1903, consequently the cost per sheet has been higher. This was due to the irregularity in supply of maps from the field, and the smaller area surveyed as already mentioned.

The topographical maps of Behera and Gharbia, which are fair-drawn and lithographed, work out, as last year, at a cost of L.E. 6,500 and L.E. 7, respectively, per average sheet. Giza, which is fair-drawn and reduced by photography, is produced at an average cost of L.E. 6, and Fayum, it is estimated, will cost L.E. 6,500.

The Town of Suez (20 sheets) has been published on a scale of 1/1000, and Mansura and Sohag were plotted and are being drawn for the final reduction by photography. Maps of Upper Egypt were published, provisionally, to meet requirements until the general map of Egypt, scale 1/50,000 can be published.

These maps, which are in active preparation, will be replaced gradually by another edition based on the results of the Topographical Survey which is being carried out after the Revenue Survey, and by which the data are revised in the field and brought up to date.

STAFF OF THE REPRODUCTION OFFICE IN 1904.

	European.	Egyptian.	Total.
Superintendents	4	1	5
Lithographers	6	2	8
Autographers	—	22	22
Draughtsmen 1st Class	4	11	15
" 2nd "	1	14	15
Arabic Writers and Typers	—	7	7
Printers	6	3	9
Assistant Printers	—	9	9
" Photographer	1	—	1
Monitors	—	3	3
Boys	—	5	5
Clerks	—	2	2
			104

STATEMENT OF MAPS AND PLANS PRINTED.

	1903	1904
Revenue Survey map sheets printed	1,328	2,648
" " " " reprinted... ..	1,331	1,200
" " " " traced	—	460
Topog. map 100,000 sheets	168	86
" " other scales sheets	23	58
Maps and plans for Public Works Ministry... ..	96	174
Maps and plans on repayment	—	41
Circulars and forms (total copies)... ..	150,000	400,000
Line and half-tone blocks	17	109
Tracings on repayment	661	695
Tracings for the Ministry of Public Works	185	187

GEOLOGY.

The work at the Geological Museum for 1904 includes the arrangement of a series in the Economical Gallery illustrating the underground structure of Egypt as recorded by borings. The large vertebrates have

been cleaned and mounted under glass cases, and the general arrangement of the Vertebrate Gallery completed. The minerals and rocks in the Rock Room, having also been classified in the table-cases, the Museum was opened to inspection on December 1st.

Dr. Andrews has examined all the Vertebrate material for inclusion in his monograph on the Fayum Vertebrata. There has also been much routine work (receiving and dispatching specimens for examination, answering questions on economic points, inspection of concessions, etc.).

A certain amount of collecting was done in the Western desert, but the funds allotted to this branch of the Department did not allow of any other work being undertaken.

Mr. Barron was placed at the disposal of the Sudan Government for the greater part of the year for work in that area, where, among other things he examined the lignite deposits of Tehelga in North West Abyssinia.

OBSERVATORY.

At the end of the year 1903 the Egyptian Government Observatory was transferred from Abbassia to Helwan.

The reason for the transfer, which had been determined on for the last four years, was partly that the buildings at Abbassia were unsuitable, partly because the site on the border between the desert and the delta was not one in which typical meteorological results could be obtained; while the proximity of railways and an electric tramway greatly interfered with the observations.

A great part of North-East Africa being devoid of vegetation, it was preferable to select a desert site, such as Helwan would afford.

The transfer was effected in such a way that no interruption was made in the continuity of the work. The observations at Abbassia were continued till the last moment of the year 1903, and those at Helwan began from the first moment of 1904.

The buildings consist of (1) a meteorological observatory one storey in height, built round four sides of a rectangular courtyard, in which are situated the offices, computing rooms, rooms for recording instruments and standard clock, and superintendent's quarters; (2) a transit house, in electrical communication with the standard clock, where the observations are made for the determination of time and the regulation of the noon time-signal. There is also an equatorial house destined to receive the Brunner 21 cm. refractor, and a magnetic observatory which, at the time of writing, is not yet complete.

WORK AT THE OBSERVATORY.

The following is a list of classes of work carried on at the Observatory.

- (a) Meteorology—continuous record of all the elements.
- (b) Chronometry—including determinations of time for the purpose of the daily noon signal, and the rating of chronometers.
- (c) Standardization, especially of meteorological instruments.
- (d) Seismology.
- (e) Magnetic observations.
- (f) Atmospheric electricity.
- (g) Determination of geographical positions for the purposes of the Survey.

As details concerning these have appeared in successive annual reports of the Observatory it will suffice to refer briefly to the features peculiar to the work in the year 1904.

(a) *Meteorology*.—The results are obtained throughout from automatic records checked by eye-readings. The types of recording instruments are similar to those used in European observatories of the highest class, with the exception that for the temperature and humidity of the air Prof. Callendar's electric recorders in conjunction with platinum-wire thermometers are used. These elegant instruments, which are of somewhat recent invention, have not as yet come into general use in meteorology, though the Transvaal Meteorological service has just adopted them in consequence of their satisfactory performance in this country.

The year 1904 is the first in which the velocity and direction of the wind have been registered on a Kew pattern anemometer. The instrument has worked well, but it has been found necessary to alter its exposure somewhat.

Modifications have also been introduced into the measurement of evaporation and air temperature: for the former a special type of instrument has been designed, differing entirely from existing patterns, with which it is hoped that results will be obtained of special interest in an irrigated country such as Egypt; as for the temperature of the air, although Prof. Callendar's recorder is still used, it has been found necessary to make important changes in the form of thermometer whose variations it records, in order to overcome difficulties peculiar to a desert exposure.

(b) *Chronometry*.—The principal changes in procedure during the year arise from the fact that the standard clock is no longer placed within hearing of the observer at the transit instrument, but in a specially designed room in the main building. The temperature of this room being very constant a very even clock rate is assured. In consequence of this alteration, the chronographic method of registering transits of stars has been adopted, and increased accuracy has thereby been obtained.

The method of automatically transmitting the daily noon signal to the Citadel at Cairo, the ports of Alexandria and Port-Saïd, and Wadi Halfa differs only in detail from that hitherto used.

(c) *Standardization of instruments*.—Under this head, a considerable amount of work has been done during the year, none of which, however, deserves special mention in this report.

(d) *Seismology*.—The principal point to note is that at Helwan much better foundations have been secured for the Milne seismograph. Consequently, the difficulty which occasionally presented itself at Abbassin, of distinguishing genuine earth tremors from the movements caused by subsidence, no longer arises.

(e.f.) *Magnetic and Electrical Observations* are continued as in previous years.

(g) Determinations of geographical positions have been made at Kafr el Batikh and at Tenna; a series of observations has also been begun at Helwan, with the object of fixing its position with the precision required for an astronomical observatory.

In conclusion it may be stated that an astronomical section is in course of formation, in anticipation of the arrival in August, 1905, of a reflector of 30 inches diameter. For this instrument the observatory is indebted to the munificence of Mr. J.H. Reynolds.

It is hoped that this fine instrument in an almost ideal climate, may make valuable additions to our knowledge of the heavenly bodies.

LABORATORY.

The following tables show the nature and extent of the work done in the Laboratory during the year ending 31st December, 1904.

Section.	No. of Samples examined.	Fee received.
		L.E. M.
Chemical Section	436	34 500
Physical Section	61	20 100
Total... ..	497	54 600

From.	No. of samples examined		Fee received
	Chemical Section.	Physical Section.	
Public Works Ministry:—			
Survey Department... ..	288	—	No charge.
Tanzim Department	87	9	
Irrigation Department	22	—	
			L.E. M.
Ministry of War... ..	20	28	3. 800
Ministry of Interior (Prison Department).	1	—	0. 200
Railway Administration	7	—	1. 500
Sudan Government	27	—	9. 450
Non-Government Sources... ..	41	24	39. 650
Total	436	61	51. 600

Nature of sample.	No. of samples examined.	
	Chemical Section.	Physical Section.
Ores, Minerals etc.	313	—
Building Stones	4	6
Cement, Hydraulic Lime and Mortar ...	17	27
Paints	24	—
Vegetable Oils	19	—
Mineral Oils	1	—
Asphalt	2	—
Drinking Water	53	—
Irrigation and Drainage Water... ..	5	—
Soils... ..	26	—
Foods (Butter, etc.)	14	—
Coal	17	—
Weights and Weighing Machines	—	28
Miscellaneous... ..	41	—
Total	436	61

GAS TESTING.

Month.	N° of nights tested.	N° of tests made.
January	20	61
February	17	51
March	21	72
April... ..	19	57
May	20	60
June	20	60
July	20	60
August	20	60
September	20	60
October	27	90
November	15	45
December	15	45
Total... ..	234	720

CHEMICAL SECTION.

The number of samples examined shows an increase of 51 % over 1903.

The Paints, Paint Oils, Turpentine, etc., forwarded for examination by Inspectors in charge of new buildings were considerably in excess of those received in 1903. Many of the paints, although not adulterated, are of second-rate quality and of the cheapest description, while others are grossly adulterated, one sample of red lead, for instance, actually delivered for use on the works, contained no lead compound whatever, but consisted of barytes coloured with a red organic colouring matter.

The paint oils are as a rule not genuine linseed oil, but contain petroleum or resin oil: one very popular brand (not, however, sold as genuine linseed oil) contains one-third of its bulk of a non-vegetable oil and another well known brand contains 15%. Much of what is supplied as turpentine is found on examination to be petroleum and not turpentine at all.

Since the beginning of October regular analyses have been made of the water in connection with the new filters of the Giza Water Service, samples from each of the two filters and from the unfiltered river water having been examined weekly.

PHYSICAL SECTION.

The number of samples examined shows a considerable decrease over 1903. This is largely accounted for by the fact that in 1903 a large number of samples of building stone were specially tested in order that the results might accompany the specimens exhibited in the Geological Museum.

The number of cements and hydraulic limes, however, received from non-government sources also fell off considerably ; it will be noted that only six samples of cement were received from government departments.

A series of weights and fifteen weighing machines were checked for the War Office.

GAS TESTING.

The gas has been tested on 64% of the nights throughout the year, a total of 720 tests having been made.

11th April, 1905.

H.G. LYONS.

Director General.

REPORT ON THE TECHNICAL DEPARTMENT

1904

BY

MD. ANIS PASHA.

CHIEF OF TECHNICAL DEPARTMENT.

TECHNICAL DEPARTMENT

YEARLY REPORT, 1904

STEAM ENGINE SERVICE.

The progress made by the Steam Engine Service in 1904 was even more marked than in the year before. The Layha being more and more understood by the Public, greater facilities have been offered for the Service to carry out and improve its work.

The applications for Rokhsas are now made in a more complete and regular form, and the time formerly wasted in getting the necessary information which must be embodied in the Demands, as prescribed by the Law, is very much reduced. These applications are now examined, and either granted or refused without much delay.

Inspection is also rendered much easier, and the difficulties which the Service had formerly to contend with are greatly diminished. The proprietors by paying more attention to the general condition and upkeep of their engines and boilers and, as I said in my former report, realizing that it is to their benefit and interest to keep them in conformity with the conditions of safety laid down by the Law, help the Service in carrying out its duty of inspection and examination without hindrance or delay on their part.

There is also a distinct improvement in the way engines and boilers are now treated and worked by their attendants, and a general tendency to keep them clean and in a better state of repair. In fact much progress has been made in improving the condition of the working engines in both Upper and Lower Egypt, especially in the former, where the state of the numerous small and scattered engines working flour mills left much to be desired. These now compare favourably with the engines in Lower Egypt, although it cannot be said that either in Upper or Lower Egypt are they as yet in a satisfactory state. In fact, the Service has a great deal to do before those much abused engines can be brought to a really satisfactory working condition.

As regards Irrigation Pumping Engines, I stated in my last report that the deplorable and grievous state in which many of them were found, when casually inspected by the officers of the Service, and the incon-

venience caused by the cumbersome system under which those inspections were carried out, suggested the expediency of taking full advantage of Article 6 of the Steam Engine Regulations issued in 1900, to bring all of them under the direct control of the Service, and subject them to the same treatment with respect to Public safety as the engines and boilers in industrial establishments are now subjected to.

This suggestion was acted upon from the commencement of the year 1904, and now all Rokhsas for Irrigation Pumping Engines, whether fixed or portable, are issued by the Technical Service after the consent of the Irrigation Inspector-General concerned in the matter. Also it has lately been arranged that, even in cases of pressing necessity, no temporary Permits to work engines are to be given by the Inspectors of Irrigation without the previous knowledge and consent of the Technical Service. Thus no engine or boiler is now allowed to work without being thoroughly inspected and pronounced to be in a good and safe condition.

Moreover, whenever the period of a Rokhsa formerly given for any of the old engines expires, its renewal is withheld till after the above-mentioned examination is made, and if the result proves unsatisfactory, the regranting of the Rokhsa is refused unless the plant is either properly repaired or altogether renewed.

This is the reverse of the usual procedure followed in the case of new plant where the Rokhsa is issued previous to the fixing of the engine, but it is found to answer very well in this instance where the engine is already fixed.

Pumping Engines already established and working with old Rokhsas are dealt with, as regards safety, in the way they have been during the last two or three years. They are inspected when complained of, or when a request is made by the Inspector of Irrigation and, in fact, whenever they are brought to our notice. This is carried out with great care, as it is obvious that no general action can be taken against them, and any change in their state must necessarily be effected gradually and cautiously. Although this Service has full power to impose any restrictions it may deem necessary for Public safety, it usually consults with the Inspector of Irrigation concerned before any serious steps are taken to stop or temporarily arrest the working of such engines; but in cases of immediate danger they are of course stopped at once.

The number of applications for Rokhsas for engines to work in industrial establishments addressed direct to the Service in the year 1904 was 490. This number, together with 96 remaining under consideration from the year before, and 18 received through the Mudirihs for

using irrigation pumping engines for industrial purposes, makes a total of 604, as against 458 the year before.

441 of these applications were granted, and 163 remain for future consideration.

360 engines out of the 441 to which Rokhsas were granted, having proved satisfactory after the examination and test, were given their permits and allowed to work. This number, with 1289 sanctioned to work up to the end of 1903, makes a total of 1649 industrial engines now working in conformity with the regulations.

The number of Rokhsas issued for Irrigation Pumping Engines during the year was 84; of these, 13 were for fixed and 71 for portable engines. These engines, whether fixed or portable, received Rokhsas, as I said before, under the steam engine rules and regulations, and were submitted to the same treatment as the industrial engines are submitted to.

The fees paid for the 84 Rokhsas came to L.E. 453.

Altogether, 780 visits of inspection were made by the staff of the Service during the year 1904, as against 750 in 1903.

Of these, 553 were made to industrial and 227 to irrigation engines.

The number of Procès-verbaux of contravention drawn up against engine proprietors during the year was 51, of which 48 were submitted to the Native Courts and 3 only to the Mixed Tribunals.

In the Native Courts 10 proprietors were condemned to stop their engines, and 38 were at the end of the year still in court awaiting trial.

The three in the Mixed Courts were all sentenced to stop their engines.

I am sorry to say the Native Courts are rather slow in trying those cases, some of which are in Court a year, or even more, before a judgment is given.

I may here mention that all Procès-verbaux of contravention against steam engine regulations are drawn up by the employés of this Service, and sent direct from here to the Courts concerned. Recently some of the Moudirihs brought two or three actions against proprietors of flour mills for having no Rokhsas for industry, and quoted in their Procès-verbaux articles from our regulations instead of from theirs, with the natural result that they lost their cases. When this regrettable fact became known to us through the Parquet, it was feared that if such mistakes were repeated they would have a detrimental effect on our cases, especially before the Mixed Tribunals; and letters of explanation were therefore sent to the Parquet, and at the same time the Ministry of the Interior was asked to draw the attention of the Mndirs to these mistakes, and to request them to prevent their recurrence, and I am glad to say they have not been repeated since.

There was only one case of boiler explosion during the year. This accident occurred in February, 1904, at Matai, Minia Province, and caused the death of one man.

It was attributed to shortness of water, but as a case of contrivention had, previous to the accident, been brought against the proprietor for overloading the safety valves, it is most probable that excessive pressure may also have been another cause.

I am sorry to say the dangerous practice of overloading safety valves is still of frequent occurrence, although the Service is exerting all its energy to stop it. It is such a favourite practice with most, if not all of the native drivers that, until the majority of them are substituted by others better instructed in their work, I am afraid no feeling of security from this evil can be attained.

Before concluding my remarks on this Service, I should like to state that Mr. Crawley and his small hard-worked staff deserve great praise for the satisfactory manner in which they have carried out their arduous and difficult work during the year.

QUARRIES SERVICE.

The total number of Rokhsas for Quarries in Cairo and its vicinity at the end of the year 1903 was 583, of which 119 were given for life, 463 for a term of 10 years, and 1 for a term of 30 years.

During the year 1904 the Service cancelled 76 Rokhsas, 22 of the former and 54 of the latter class, while 56 new ones were granted, of which 50 were for Quarries and 6 for gathering gypsum.

The total number in hand at the end of 1904 will thus be:—

Rokhsas for Quarries given for life [119-22]...	...	...	...	97
" " " " " 10 years [463-54+50] ...				459
" " Gypsum " " 5 " ...				6
" " Clay " " 30 " beginning from 1901				1
Total ...				<u>563</u>

The fees received for the new Rokhsas amounted to L.E.3,960,400.

The different localities of the licensed Quarries under the control of this Service, and the time of expiry of their Rokhsas, are shown in the annexed table.

CENTRAL STORES

I.—ARTICLES PURCHASED OR MADE.

(A) Instruments and camp equipments.

Purchased from Europe	{	England	L.E.	M.		
		France.	408	590		
			46	428	L.E.	M.
					455	027
Made by Govt. Services	{	War Office	113	850		
		National Printing Off.	159	047		
		Arsenal	36	560		
		Tanzim Department	3	500		
					312	957
Purchased in Egypt...					75	560
						L.E. M.
						843 544

(B) Furniture.

Made by Govt. Services	{	Arsenal	154	917		
		Guizah Water Service	5	972		
					160	889
Purchased in Egypt...					194	576
						355 465
						1199 009

II.—REPAIRS TO INSTRUMENTS.

Repairs made at the Arsenal						380 000
Total					L.E.	1,579 009

III.—ARTICLES ISSUED AGAINST PAYMENT.

To the Nile Steamer Service... ..					0	067
" Projects Circle					3	245
" Sudan Irrigation Service					21	700
						25 012

IV.—ORDERS GIVEN TO THE STORES.

For issue of articles.....	{	to Govt. Services ...	No.		
		against payment.. ...	231		
			4		235
For receipt of articles..	{	returned	110		
		purchased	49		
					159

The value of the articles delivered from Stores and charged to the Budget was L.E. 1,482,316, distributed as follows:—

Irrigation Department					L.E.	M.
Tanzim Department					586	271
Administrative Service					460	201
Technical Department					357	510
Reservoir Department					47	589
					30	745
Total					L.E.	1,482 316

ARSENAL AND BOATS.

The value of the work executed in the Arsenal workshops, and the materials delivered from its stores during the year 1904, amounted to L.E. 17,017 as against L.E. 21,327 in 1903.

Nearly 87.7 % of this amount was charged to the different branches of the Ministry of Public Works and 12.3 % was charged to other Government Departments and private individuals, shown as follows:—

	1904	1903
Cost of material and value of work executed for Public Works Department... ..	L.E. 13,050	L.E. 17,021
Cost of coals and engine room stores for steamers	1,767	2,031
Total for P.W.D. ...	L.E. 14,817	19,052
Cost of materials and value of work for other Government Departments	1,826	2,028
Cost of material and value of work for private individuals	374	247
Grand Total	L.E. 17,017	21,327

The distribution of the first two items is shown in the following statement:—

SUM CHARGED TO THE DIFFERENT BRANCHES OF THE PUBLIC WORKS DEPARTMENT.

	1904	1903
Irrigation Department	L.E. 6,631	L.E. 11,188
Tanzim Department... ..	834	638
Survey Department... ..	2,101	1,252
Administrative Service	48	51
Technical Service	317	316
Repairs to steamers and maintenance of Arsenal plant... ..	3,113	3,546
Total	L.E. 13,050	17,021

SUM CHARGED TO OTHER GOVERNMENT DEPARTMENTS.

	1904	1903
Ministry of Justice	L.E. 22	L.E. 10
" Finance	100	49
" Interior... ..	66	325
" Public Instruction	271	169
" War	54	45
Army of Occupation	118	11
Sanitary Department	421	360
Khedivial Yachts	10	3
Model Workshops	37	848
Daira Sanieh	35	—
Government Railways	10	—
Mudirihs, Governorates and Town Councils ...	548	208
Sudan Government... ..	134	—
Total	L.E. 1,826	2,028

It will be seen from the above statements that the total cost of work executed in 1904 was less by L.E. 4,310 than in 1903. This was due to the quantity of work ordered by the Irrigation Circles having been much smaller this year than the year before. Its cost amounted, as shown above, to L.E. 6,634 as against L.E. 11,188 the difference L.E. 4,554 is nearly the same as the above difference between the total amounts.

The main items in the charge against the Irrigation Circles were for:—

	1904	L.E.	1903	L.E.
Steel pipes	184 tons	2,257	459 tons	5,840
C. I. Grooves	151	1,690	119	1,259
Regulating timbers	3,094 pieces	1,518	1,780 pieces	1,104
Miscellaneous work and stores	... ..	<u>1,169</u>	... ..	<u>2,985</u>
Total	... ..	<u>6,634</u>	... ..	<u>11,188</u>

The Tanzim Department was supplied with practically the same kind of work as last year. This work consisted of:—

	L.E.
Repairing barge for Kasr-el-Nil Bridge	201
Making and repairing carts	186
Different castings	190
Miscellaneous work	<u>260</u>
Total	<u>L.E. 837</u>

The Survey Department was supplied with triangulation marks to the amount of L.E. 595, and technical apparatus, office furniture and fittings, and sundry other work for L.E. 1,506.

The Administrative Service paid L.E. 48 mainly for office furniture; while the Technical Service was charged L.E. 275 for instrument repairs for the Central Stores, and L.E. 42 for office furniture and other small work for the Steam Engine Service.

The work supplied to the other Government Departments was of the same assorted kind mentioned in former reports.

To the Arsenal Workshops very little was done again this year. A small screw-cutting machine was added in the fitting shop for L.E. 70, the other machines were repaired and their tools replenished for L.E. 48, and the shop engine overhauled and put in good working order for L.E. 44; also a small pattern shop was built in place of the old one, which was added to the carpenter shop, for L.E. 85. These items, together with L.E. 406 spent in hand tools and other necessities for the shops, make the total cost of maintenance L.E. 653. Of this amount L.E. 312 was paid from the Arsenal profits and the rest, being, L.E. 341 from the budget.

On the river, some of the rowing boats, barges and lighters were repaired, the landing stage at Kasr-el-Dukara put right, a new landing stage for the use of our steamers at Luxor was made, and the new tug-boat under construction nearly completed for L.E. 525.

The sum of L.E. 3,113 shown above, under the head of repairs to steamer and maintenance of Arsenal plant, is distributed as follows:—

	L.E.
Maintenance of Workshops	650
„ „ river plant	525
Repairs to steamers	1,737
	<hr/>
	2,915
Spent on new tools entered in store	198
	<hr/>
Total ... L.E.	<u>3,113</u>

The cost of materials bought for the use of the Workshops and steamers, exclusive of coals, amounted to L.E. 10,130.

Of this amount, materials to the value of L.E. 2,776 were ordered direct from Europe by the Service, while L.E. 7,354 worth was taken from local merchants.

The total quantity of coals bought during the year amounted to 31,577 kantars and cost L.E. 2,171. Of this quantity 20,404 kantars costing L.E. 1,106 were delivered direct to the Arsenal Stores, and 11,173 kantars, costing L.E. 1,065, were taken from Cook's and Daira Sania's coaling stations for the use of steamers when in commission.

The total amount spent on materials and coals during the year was thus L.E. 12,301.

The quantities issued to the Workshops and steamers amounted in value to L.E. 11,911, shown as follows:—

	L.E.
Value of materials used in Workshops... ..	8,989
„ „ coals „ „ „	796
„ „ deck stores for steamers	359
„ „ engine room stores for steamers	239
„ „ coals for steamers	1,528
	<hr/>
Total value of quantity issued L.E.	<u>11,911</u>

The total cost of labour during the year amounted to L.E. 4,100. The average cost of the work turned out by the Workshops has remained almost the same as the year before. Of that supplied to the Irrigation Circles, Cast Iron Grooves of the ordinary type cost L.E. 9 per ton delivered in the Arsenal, that with strips requiring planing by machine L.E. 10 per ton. The cost of sleepers also remained unchanged as it depends on the price of wood which has been constant for the last three or

four years. The rate of cost of steel pipes including transport, and in some places also erection, came to L.E. 12,258 per ton as against L.E. 12,250 which is practically the same.

The quality of this work does not call for any remark, being in general of the best of its kind that can be made in the country.

STEAMERS.

The total expenditure on the steamers came to L.E. 5,728. Of this sum L.E. 1,737 was spent on repairs, cabin fittings and deck stores, L.E. 1,767 on coals and engine room stores, and L.E. 2,224 on the crews and Hors cadres employés. This is shown in detail in the following statement:—

STEAMERS.	Repairs, &c.		Coals, &c.		Crews, &c.		Total.	
	L.E.	M.	L.E.	M.	L.E.	M.	L.E.	M.
Messir	82	023	209	736	121	350	413	109
Nasratieh	4	140	—	—	271	420	275	560
Tahta	148	117	156	109	323	000	627	226
Kabira	78	366	198	652	153	607	430	625
Bulak	52	817	237	159	216	597	506	573
Refik	131	664	201	650	193	409	526	723
Dendera	91	767	231	310	224	056	547	133
Rekib	76	392	92	588	182	307	351	287
Tawaf	539	738	99	340	141	211	780	289
Daleel	43	159	156	138	123	611	712	908
Mueris	59	701	62	448	73	219	195	368
No. 74	9	501	36	895	50	650	97	046
No. 25	3	637	69	302	95	400	168	839
Dredger No. 206... ..	25	843	15	809	54	072	95	724
Total... ..	1,736	865	1,767	136	2,223	909	5,727	910

Of this expenditure the sum of L.E. 4,961,067 was paid from the Technical Service Budget, L.E. 25,843 from the Arsenal profits, and L.E. 741 was received for coals and engine room stores consumed by the steamers when lent.

Before high Nile all repairs mentioned in my last report were carried out, and all the steamers were ready for service. On their return at the end of the flood season they were, as usual, thoroughly overhauled

and examined, and those that required immediate repairs were taken in hand at once. No steamer was docked in 1904 but many of them will require docking in 1905.

The Nasratieh is still out of commission, and there is no prospect of carrying out her extensive repairs and alterations for some time yet.

The Messir is in good condition but requires, of course, slight repairs to keep her clean and fit for the occasional duty she does.

The Dendera, although the newest boat we have, requires more looking after than any of our old steamers. This year her engine and boiler were repaired and readjusted and her hull and cabins repainted.

The Tahita was found to require her decks renewing and her staircases altering, and was taken in hand at once. She is also being fitted with electric light. Her engines were thoroughly repaired before flood.

The Rekib like the Tahita requires new decks and general overhauling; she will be taken in hand as soon as she can be spared and put out of commission.

The Relik is the steamer which was bought from the Police; she is a sister ship to the Rekib and Tawaf. Her boiler is very old and requires renewing. A new boiler is ordered for her from Europe.

The Tawaf was thoroughly repaired in the early part of the year, and also supplied with a new boiler which slightly increased her speed and made her somewhat economical. She has done much service at the latter end of the year.

The Kahira was in a good condition when sent with the Daleel to Upper Egypt on duty for the Finance Ministry. On her return she was found to require general repairs.

The Daleel, formerly steam tug No. 1, was turned into an irrigation inspection steamer. It was finished before the flood season and sent with the Moeris and Kahira to Upper Egypt for duty during high Nile. Her cabin arrangements were found not to be quite sufficient for the requirements of the Inspectors, also her boiler which is a new one, was found to require forcing to generate the quantity of steam necessary for her old engines. It was therefore decided to fit her with a new pair of engines of more modern type, made in the Arsenal which will be more suitable to the boiler, and as they will take less room than the old engines the space gained will admit of more cabin accommodation and allow the deck to be carried the whole length of the steamer after the type of the Bulak and Kahira. This work is being carried out.

The Bulak is always in Upper Egypt attached to the 5th Circle of Irrigation. She only comes to the Arsenal when her Engineer finds her to require general repairs.

The Moeris was doing duty all the year, and worked harder than any steamer in the fleet. She is in a very bad state of repair, and will be taken in hand as soon as she is back from Upper Egypt, where she is at present.

No. 74 is always doing duty as a small tug for the Arsenal. Her boiler is very old and requires to be renewed.

The new steamer we are building in the Arsenal to replace Tug No. 1 ought to have been finished by this time, but unfortunately the shop engines were found to be giving way, and had to be stopped and temporarily replaced by the new boat's boiler till the one we immediately ordered from Europe for the shops arrived. This, of course, delayed the finishing of the steamer, but I hope it will be completed before high Nile.

No. 25 is always attached to the 1st Circle of Irrigation, doing duty on the Ismailieh Canal. From time to time she comes to the Arsenal for repairs.

I would add that Mr. Curtis has carried out his work in the Arsenal in his usual able and satisfactory manner, as shown by the way in which the work has been turned out by the staff and men under his charge.

M. ANIS.

Chief of Technical Department.

Cairo, 3rd April, 1905.

QUARRIES SERVICE.

YEARS OF EXPIRY OF ROKHSAS.

LOCALITY.	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1929	Rokhsas for life.	Total.
<i>I.—Stone and balat quarries.</i>													
Helwan	11	6	4	10	3	6	6	3	7	6	—	1	63
Ma'sara (el)	3	4	—	4	5	1	1	1	9	4	—	3	41
Tura	1	3	5	—	2	—	1	1	—	1	—	21	38
Eyouti Moussa	1	2	—	3	2	—	—	—	1	—	—	9	18
Ennara (el)	7	8	7	6	3	3	1	1	—	2	—	1	42
Tahlita (el)	1	1	—	—	—	—	—	—	—	3	—	2	7
Ein el Sira	2	—	2	—	3	—	—	2	—	5	—	6	21
Aboul Seoud	1	—	1	—	—	—	—	—	—	—	—	4	8
Atar el Nahl	3	—	5	5	2	—	6	3	3	1	—	4	32
Hayssan (el)	2	—	—	—	—	2	—	—	—	—	—	—	4
Almar (el)	1	18	16	4	3	3	2	1	3	7	—	3	64
Mondidasa (el)	—	3	1	6	1	2	1	2	—	3	—	10	28
Zawiet Naara	—	2	3	7	10	2	7	2	3	4	—	8	48
Doueyka	—	1	3	1	3	4	4	—	—	—	—	2	21
Batu el Bakra	—	3	3	3	3	6	2	2	4	6	—	6	38
Hachml (el)	—	—	2	—	—	—	—	—	—	—	—	1	3
Abind (el)	—	—	5	6	—	—	3	—	2	—	—	8	24
Messan (el)	—	—	—	1	—	—	—	—	—	—	—	—	1
Harif (el)	—	—	—	—	—	1	2	1	2	—	—	—	6
Gazalani (el)	—	—	—	—	—	—	—	—	3	—	—	—	2
Rhachab (el)	—	—	—	—	—	—	—	—	—	—	—	1	1
<i>II.—Pebble, stone and sand quarries.</i>													
Helwan	—	—	—	—	—	1	—	—	1	—	—	—	2
Basatine (el)	—	—	—	1	1	—	1	—	—	—	—	—	3
Ablassleh (el)	2	1	4	—	4	6	2	4	2	2	—	—	30
Almar (el)	—	—	—	—	1	—	2	1	2	1	—	—	10
<i>III.—Gathering of gypsum.</i>													
6 Zouca	—	—	—	—	6	—	—	—	—	—	—	—	6
<i>IV.—Extraction of clay.</i>													
Ma'sara (el)	—	—	—	—	—	—	—	—	—	—	1	—	1
Total... ..	38	52	64	57	55	40	14	24	41	50	1	97	563

RAPPORT DU SERVICE DES ANTIQUITÉS

POUR L'EXERCICE 1904

PAR

G. MASPERO

DIRECTEUR GÉNÉRAL.

RAPPORT DU SERVICE DES ANTIQUITÉS

Pour l'Année 1904.

I. — SERVICE ADMINISTRATIF.

L'augmentation de notre budget n'a été cette année que de L.É. 222, portant en entier sur le personnel classé. J'ai pu relever les salaires de quelques-uns de nos fonctionnaires le moins bien rétribués, notamment ceux de deux des inspecteurs indigènes de troisième classe, Youssef Effendi El-Saïdi et Nessim Effendi Youssef ; toutefois la situation de la plupart des autres demeure précaire, et de nouveaux crédits seront nécessaires à bref délai, si nous voulons qu'ils puissent remplir leurs fonctions consciencieusement, sans préoccupations étrangères au Service.

Inspection du Directeur Général. — Cette année encore il m'a fallu louer un remorqueur à la Compagnie Cook, et, après être remonté jusqu'à Assouan, d'une traite, à la vapeur, j'ai dû redescendre à la rame d'Assouan au Caire. L'inspection a duré deux mois et demi, du 16 décembre 1903 au 2 mars 1904. Un peu au nord de Bouéib, entre Silsileh et Edfou, j'ai examiné les ruines nommées el-Galila par les indigènes, et j'ai eu le regret de constater qu'une partie d'entre elles avait été détruite à la mine, depuis mon passage dans cet endroit, en 1886. Sur les indications et en compagnie du professeur Schweinfurth, j'ai visité un petit sanctuaire situé sur un des points les plus élevés de la montagne Libyque, presque en face du village de Gamoléh, au nord-ouest de Thèbes ; quelques coups de pioche donnés sous nos yeux ont ramené un jour des fragments d'inscriptions et de statues, qui nous ont permis de constater qu'il était consacré au dieu Thot cynocéphale et qu'il avait été bâti ou restauré par Néchao II de la XXVI^e Dynastie. Ce sont les deux seules localités nouvelles que j'aie eu le loisir d'aborder au cours de ce voyage ; presque tout mon temps a été absorbé par la révision des localités connues, que j'ai eu la satisfaction de trouver presque toutes en bon état, et par l'inspection de nos chantiers de reconstruction. La situation est demeurée stationnaire dans les temples de Gournah et de Deir-el-Medineh ; le danger d'un ébranlement est toujours à craindre, mais j'espère, malgré tout, que nous arriverons à temps pour le conjurer.

Travaux des Inspecteurs en chef.— L'expérience des cinq années écoulées depuis 1899 avait démontré de façon si évidente l'utilité des inspecteurs en chef, que le Gouvernement a bien voulu m'accorder l'argent nécessaire pour en augmenter le nombre; il y en aura deux de plus à partir du 1^{er} janvier 1905. En 1904, MM. Quibell et Carter ont supporté, à eux seuls, tout le poids du service en province, dans les mêmes conditions qu'auparavant: rien n'avait été prévu encore pour leur assurer un personnel de secrétaires ou de comptables, et, tandis que M. Quibell a continué à se servir des employés du bureau central pour ses comptes et pour sa correspondance, M. Carter a toujours ses deux secrétaires provisoires, Tewfik Effendi Boulos et Chelata Ayoub. MM. Carter et Quibell sont demeurés, l'un et l'autre, jusqu'au mois de novembre 1904, dans la province à laquelle ils avaient été préposés dès leurs débuts, le 1^{er} janvier 1900. Il avait été convenu à cette époque que la période de roulement serait de trois ans pour eux, et que, le 1^{er} janvier 1903, M. Carter changerait de poste avec M. Quibell. Toutefois le 1^{er} janvier 1903, M. Carter, retenu à Thèbes par les travaux qu'il avait entrepris, demanda à prolonger son séjour au Saïd pendant deux hivers de plus; c'est seulement au mois de juin dernier qu'il annonça l'intention d'user de son droit. Le 15 novembre dernier, M. Carter a pris charge de l'Inspectorat du Nord, tandis que M. Quibell est passé dans celui du Sud. Cette répartition du territoire égyptien entre les inspecteurs a duré quelques semaines à peine. En premier lieu, la création d'un troisième inspectorat, prévue pour l'exercice 1905, a entraîné un remaniement des anciennes circonscriptions. L'inspectorat du Nord qui était beaucoup trop étendu, a été divisé en deux provinces; celle du Delta comprenant les neuf moudiriels de Charkieh, Dakahlieh, Gharbieh, Béhéra, Menoufiéh, Kalioubieh, Gizeh, Fayoum et Béni-Souef, est restée sous les ordres de M. Carter; celle de la Moyenne Égypte, comprenant provisoirement les trois moudiriels de Minieh, Assiout et Girgoue a été confiée à M. Gustave Lefebvre, entré au Service le 1^{er} janvier 1905. De plus, le 22 décembre 1904, M. Quibell a été transféré du Saïd à Sakkarah, pour y commencer l'exécution du plan de fouilles dont il sera question plus loin dans ce rapport: afin de pourvoir à son remplacement, le Ministère des Finances voulut bien nous accorder à la même date l'argent nécessaire à la création d'un quatrième poste d'inspecteur en chef, pour lequel M. Weigall fut désigné en janvier 1905.

1^{er} Inspectorat du Sud. — La construction de la maison de l'inspecteur en chef à Louxor a été poussée activement par M. Baraize pendant les mois d'avril, mai et juin, mais le manque d'argent m'a forcé à sus-

pendre les travaux le 22 juin : nous n'avons pu les reprendre que le 15 décembre suivant, et ils ne seront pas achevés avant juin 1905.

La lumière électrique a fonctionné dans les Bilau-el-Moulouk, de novembre 1903 à avril 1904, pendant la saison des touristes. Grâce aux améliorations introduites l'an dernier dans l'usine, le réseau a pu être développé sans inconvénient et la tombe de Ménéphthah a été aménagée, ce qui porte à sept le nombre des hypogées qui sont éclairés régulièrement. Les négociations ouvertes avec la Compagnie Cook, en 1903, pour l'installation à Ibsamboul d'un système semblable à celui de la Vallée des Rois, n'avaient abouti à un contrat formel en décembre 1903. La Compagnie s'engageait, moyennant une somme de L.É. 170, à placer dans le grand Spéos un réseau de fils et des groupes de lampes qui diminueraient considérablement l'emploi des torches, des bougies et du fil de magnésium : un appareil récepteur, placé à l'entrée, permettrait à notre ghafir de mettre le réseau en communication avec les appareils producteurs qui se trouvent à bord de tous les bateaux-touristes et d'illuminer pendant la visite les chambres obscures. Les travaux ont été exécutés en moins de deux mois, et le système a été essayé par les bateaux à vapeur qui ont circulé entre Assouan et Ouadi-Halfa en avril et en mai ; les résultats ont été très satisfaisants. Le succès de cette tentative, qui est dû pour beaucoup à l'obligeance de la Compagnie Cook et à l'habileté de ses agents, ne peut que nous confirmer dans notre projet d'établir un éclairage analogue aux nécropoles de Sakkarah.

Les travaux de réfection et de fouilles ont été plus nombreux que les années précédentes : M. Carter a en effet désiré achever avant son départ, si non tous ceux qu'il avait commencés, du moins la plupart d'entre eux, et je me suis efforcé d'acquiescer à son désir dans les limites que notre budget me le permettait. Le développement qu'Assouan prend comme station d'hiver m'avait engagé à mettre en valeur les rares monuments antiques qui s'y trouvent, de manière à en faciliter l'accès. Le seul que l'on connaisse jusqu'à présent dans la ville même, le petit temple ptolémaïque d'Isis, découvert par Mariette il y a quarante ans, disparaissait presque sous les décombres. Sur mon ordre, M. Carter l'a fait déblayer, en janvier et en février 1904, au prix convenu de L.É. 90, par un entrepreneur indigène, le sieur Omar Khaled, puis il confia à deux entrepreneurs anglais, MM. Urquhart et Williams, le soin de l'entourer d'un mur qui le sauvât contre l'invasion des terres : cette deuxième opération nous a coûté L.É. 175. Actuellement le temple est en bon état et peut devenir un but de promenade intéressant pour les résidents ou pour les voyageurs de passage. Par malheur, le voisinage est assez peu attrayant, huttes arabes, maisons mal famées, sables et monticules d'immoudices ;

peut-être la Municipalité aurait-elle avantage à demander les terrains que le Gouvernement possède aux alentours, et à les transformer en un square planté d'arbres, ainsi qu'elle fait près de la Cathédrale et de l'Hôtel de la Cataracte. Sur la rive gauche du Nil, les tombeaux des princes d'Éléphantine ont été vidés et munis de portes; quelques réparations de peu d'importance ont été faites au Deir Amba Siméon, dans l'abside de l'Eglise et dans les longues galeries du dortoir monastique.

A Thèbes, le dégagement du Ramesseum a été poussé très loin par M. Baraize, mais le temps de M. Carter a été absorbé par deux entreprises de nature différente. D'une part, il a muni de solides portes en fer les principales des tombes désensablées, dans la Vallée des Reines par M. Schiaparelli, à Cheikh Abdel-Gournah par M. Mond; d'autre part, il a nettoyé dans la Vallée des Rois l'hypogée de Ménéphthah, puis achevé l'exploration de l'hypogée de la reine Hatchepsoutou. L'hypogée de Ménéphthah était connu depuis longtemps, mais personne n'y avait pénétré plus loin que la Salle Hypostyle; le fond en était rempli d'une masse compacte de terre et de débris entraînés jusque là par les pluies d'orage. M. Carter a tout retiré, et il a eu le regret de constater que la décoration des parois avait souffert grandement, mais il a trouvé le sarcophage du Pharaon et le couvercle en granit rose, sur lequel une figure d'Osiris en ronde bosse est couchée de son long. L'intérêt qui s'attache à Ménéphthah, pour ce qu'on l'a identifié généralement au Pharaon de l'Exode, m'a déterminé à ouvrir son tombeau aux visiteurs, malgré les dommages qu'il a subis : des plans inclinés et des escaliers en bois mènent jusque dans les chambres funéraires, et la lumière électrique y fonctionne ainsi qu'il est dit plus haut. L'exploration de l'hypogée de Hatchepsoutou a présenté des difficultés sérieuses, comme je le craignais d'après l'expérience de l'hiver précédent; parvenu aux chambres funéraires, M. Carter a dû les traverser à la sape, tant les bords durcis qui les avaient comblées offraient de résistance à ses ouvriers. Elle avaient été violées de bonne heure et quelques-unes des portions du mobilier funèbre usurpées par Thoutmôsis IV : on n'y a recueilli que des débris de vases ou de *Répondants* en pierre, et la décoration des parois, si elle exista jamais, a disparu entièrement. Elles conservaient pourtant trois sarcophages admirables, dont deux avaient été taillés pour la reine elle-même, tandis que le troisième avait appartenu à Thoutmôsis I^{er} ; on ne saurait deviner encore pour quelle raison ce dernier fut transporté dans un endroit où il n'avait que faire. Le caveau est derrière la stèle de la chapelle des offrandes à Deir-el-Bahari, ainsi que je l'avais conjecturé dans mon rapport de l'an dernier, à vingt ou vingt-cinq mètres de distance de la paroi extérieure du cirque, autant que j'en puis juger. M. Théodore Davis,

qui a supporté les frais de ce long travail, a reçu pour sa part l'un des sarcophages : les deux autres sont au Musée du Caire.

J'ajoute, pour terminer ce qui concerne l'inspectorat du Sud, que l'activité de M. Carter et la vigilance avec laquelle il surveille les opérations du *sébakh*, nous ont procuré l'acquisition de plusieurs beaux monuments, un grand naos de Nectanébo, un sarcophage en granit rose de la XXII^e Dynastie, avec la mention du roi-prêtre Harsîésis, des bas-reliefs d'époque gréco-romaine : tous ces monuments ont été expédiés au Musée dans le courant de l'année.

2^o *Inspectorat du Nord*. — M. Quibell, délégué à l'Exposition de Saint-Louis, afin d'y installer la section de l'Égypte antique, est parti le 20 janvier 1904, et il est rentré au Caire le 14 juin : il a obtenu son congé à la date du 15 juillet, il est revenu le 31 octobre, et il a pris l'inspectorat du sud le 15 novembre suivant. L'inspectorat du nord a donc été de fait, placé sous la direction de M. Carter pendant l'année entière. Comme toujours, les affaires contentieuses y ont joué un rôle plus grand que les travaux d'archéologie. La consolidation d'Abydos, entreprise en 1903, a été achevée d'une manière à peu près satisfaisante par l'inspecteur Salib Risk, et les portions du temple le plus menacées naguère sont à l'abri d'un écroulement soudain. Toutefois nous sommes loin d'en avoir fini avec lui. Les poutres de fer qui maintiennent les architraves brisées sont trop fortes et trop visibles aux visiteurs ; ceux-ci ont la satisfaction de constater que les sommes perçues par le Service sont vraiment dépensées pour la sauvegarde des monuments, mais cet appareil de fer n'est pas assez discret et il s'impose trop à l'attention. Dès que nous aurons pourvu aux besoins les plus urgents des autres temples, nous corrigerons ce défaut et nous compléterons la consolidation du Memnonium de Sétoni 1^{er}. Nous avons peu travaillé en dehors d'Abydos. J'ai apporté quelques améliorations à la fermeture des hypogées d'el-Amarna, par les soins de Sobhi Effendi Arif, inspecteur de Minieh, et M. Barsanti a étayé en plusieurs endroits les souterrains du Sérapéum. Dans la nécropole même de Sakkarah, grâce à la générosité de M. de Bissing qui a bien voulu se charger des frais, j'ai fait compléter l'aménagement et rectifier l'éclairage de l'hypogée de Marourouka.

La surveillance des tells a entraîné les mêmes complications que les années précédentes. M. Carter s'est appliqué avec vigueur, et souvent avec succès, à réprimer la fraude sur la vente des matériaux et des billets de touristes ; c'est grâce à lui que l'enquête instituée sur le compte de l'inspecteur d'Abydos, Salib Risk, a été menée à bonne fin, et, comme on le verra plus bas, son action n'a pas été moins efficace dans d'autres affaires du même genre, à Tantah, à Bédérèchein et à Sakkarah.

Inspecteurs indigènes, rîs et ghafirs. — L'action des inspecteurs indigènes, des rîs et des ghafirs a été presque partout efficace dans l'inspection du sud. L'inspecteur d'Edfon et d'Assouan s'est montré un auxiliaire précieux pour M. Barsanti dans la réfection des temples d'Edfon et de Kom Oumbo, pour M. Carter dans le déblaiement du temple et des tombeaux d'Assouan. L'inspecteur de Louxor, Hassan Effendi Hosni, a aidé de son mieux M. Legrain et les autorités locales à protéger Karnak, et je n'ai eu qu'à me louer du zèle de l'inspecteur de Denderah, Youssef Effendi el-Saïdi. Seul l'inspecteur de Gourmeh, Morsi Effendi Halim, n'a pas répondu entièrement à l'idée que nous nous étions faite de ses capacités, après l'essai de la première année.

Pour la région du nord, l'inspecteur de Minieh-Assiout, Sobhi Effendi Arif, a su maintenir l'ordre dans la circonscription difficile qui lui est dévolue. Les fouilles illicites et les vols d'antiquités y ont diminué de beaucoup, depuis qu'il l'a prise en main, et le service s'y fait de plus en plus régulièrement; le rapport de ses opérations et des résultats qui nous en sont accrus sera publié dans un des prochains numéros de nos *Annales*. Malheureusement, deux autres inspecteurs, Mohammed Effendi Chaban et Mohammed Effendi Doheir ont fait preuve d'une mollesse que la maladie seule peut excuser chez le premier, et, ainsi qu'il vient d'être dit, nous avons dû nous séparer de l'inspecteur d'Abydos, Salib Effendi Risk. M. Quibell, obligé de se rendre à l'Exposition de Saint-Louis, lui avait laissé le soin d'achever la consolidation du temple de Sétou I^{er}. En examinant les chantiers, le 8 février, j'avais été content de la manière consciencieuse dont ils étaient guidés, mais j'avais cru reconnaître dans les règlements de comptes, des irrégularités fâcheuses. J'é priai donc M. Bazil, Secrétaire du Service, de réclamer des explications et des pièces régulières à ce sujet, mais l'inspecteur laissa sans réponse les lettres de rappel, et, après six semaines d'attente inutile, je me décidai à procéder contre lui. M. Carter se rendit à Beliaueh, où trois jours d'enquête, du 15 au 17 juin, lui fournirent des preuves surabondantes de négligence : non seulement les ouvriers d'Abydos n'avaient pas été payés, mais aucune comptabilité régulière des dépenses n'était tenue depuis plusieurs mois. Le décompte des sommes confiées à Salib Effendi Risk, tant pour les travaux et fournitures qu'à titre d'avance personnelle, fit ressortir un déficit de caisse de L.E. 15.445 millièmes qu'il ne put justifier: je dus le déférer au Conseil de Discipline du Ministère des Travaux Publics. Cité à comparaître le mercredi 13 juillet, il ne contesta pas le chiffre du déficit, mais il déclara que la somme avait été dépensée pour le service, sans qu'il fût en état d'en établir la répartition, et il avança pour sa défense que les soucis à lui causés par

de lourdes charges de famille l'avaient empêché de mettre ses livres à jour : il apporta les preuves de l'emploi de L.E. 5,695 millièmes et il demanda un délai de six jours pour rembourser les L.E. 9,750 millièmes restantes. Le mardi suivant, 19 juillet, le remboursement ayant été effectué, le Conseil usa d'indulgence : il écarta la présomption de malversation, qui l'aurait obligé à renvoyer l'inspecteur devant les tribunaux, et il se borna à réclamer de lui une démission pure et simple, pour cause de négligence invétérée et pour défaut d'aptitudes administratives. La place devenue vacante par le départ de Salib Effendi n'a pas été remplie en 1904, l'insuffisance du traitement offert aux inspecteurs de troisième classe décourageant tous les candidats qui présentaient les qualités requises.

Un incident du même genre faillit se produire dans la circonscription de Tantah, mais, grâce à l'action rapide de M. Carter, l'affaire s'arrangea sans dommage pour le Service, et dans des conditions telles qu'il ne fut pas nécessaire de poursuivre l'inspecteur en faute; toutefois, celui-ci a reçu une réprimande sévère, et il a été prévenu qu'à la première infraction nouvelle il serait déféré au Conseil de Discipline. Le dommage a été plus grave dans le district des Pyramides, qui était rattaché directement au Musée, et où la police des monuments était exercée par le réis Ibrahim Faied pour Gizéh, Abou-Raouache et Zaouiet-el-Aryan, par le réis Roubi Hamzaoui pour Sakkarah, Abousir, Dahchour et Licht. Nous n'avons que des éloges à accorder au réis Ibrahim qui, avec des moyens insuffisants, réussit à maintenir à peu près l'ordre dans des localités difficiles, mais à Sakkarah nos affaires avaient pris récemment une tournure défavorable. Le réis Roubi Hamzaoui, malade depuis près d'un an, avait remis ses pouvoirs à son fils Khalifa Hamzaoui : il mourut au mois de juin, et sa mort est une perte réelle pour notre Musée. Dès l'âge de douze ans, en 1850, Mariette l'avait utilisé aux fouilles du Sérapéum, puis, lors de la fondation du Service des Antiquités, en 1857, son père Hamzaoui ayant été choisi pour diriger les travaux de Sakkarah, il était devenu l'un des agents les plus habiles de la découverte. A la mort de son père, vers 1873, il avait été nommé réis à son tour. Doté d'une mémoire prodigieuse, il connaissait l'emplacement exact de tous les mastabas explorés par Mariette et par ses successeurs pendant un demi-siècle, et il conservait intacte la tradition des grandes fouilles d'où la partie la plus importante de notre Musée est sortie. La maladie et la vieillesse l'avaient contraint à relâcher sa surveillance, à partir de 1901, et, dans mes dernières inspections, j'avais remarqué des faits qui me donnaient lieu de redouter que son fils Khalifa ne fût pas à la hauteur de la tâche qu'il avait acceptée. Il me parut nécessaire de confier les

lieux à des mains plus sûres. Je constituai donc une inspection nouvelle des trois mondirichs de Beni-Souef, Fayoum et Ghizeh, et, je l'attribuai à l'inspecteur de Zagazig, Ali Effendi Habib, envoyant à Zagazig l'inspecteur du Fayoum, Mohammed Effendi Chabân ; je priai, de plus, M. Carrier d'ouvrir une enquête sur l'état du district. Elle s'étendra bien certainement sur plusieurs mois de l'année 1905, mais beaucoup de faits sont venus au jour qui, dès à présent, nous ont montré combien le mal était profond : quelque regret que j'éprouve à me séparer d'une famille attachée depuis un demi-siècle à la fortune de notre Service, je crains qu'il ne me soit pas possible de conserver à Khalifa Roubi les fonctions que son père et son grand père avaient exercées à Sakkarah avec tant d'éclat.

Le nombre de nos ghafirs n'a augmenté que de six unités au cours de cette année. Le tableau suivant montrera quelle est la répartition actuelle de ces gardiens sur le sol de l'Égypte, ainsi que la quotité de leur solde et les fonds sur lesquels elle est imputée :

INSPECTORATS.	NOMBRE	Sur ch. 1, art. 2 Personnel Hors cadre.		Sur ch. 1, art. 1 Famille.		Fonds des Touristes.	
		L. E.	M.	L. E.	M.	L. E.	M.
<i>Inspectorat du Nord :</i>							
Menoufieh-Gallionieh	2	12	—	12	—	—	—
Charkieh-Dahkalieh	10	99	—	12	—	12	—
Gharbieh-Béhéra... ..	5	36	—	24	—	—	—
Gizeh-Fayoum	73	537	—	72	—	519	—
Minieh-Assiout	33	110	400	48	—	265	400
Girgouch... ..	13	36	—	24	—	105	—
<i>Inspectorat du Sud :</i>							
Dendérah	12	24	—	12	—	110	400
Louxor	15	12	—	—	—	174	—
Gournah	36	12	—	144	—	306	400
Edfon-Assouan	26	108	—	—	—	210	—
Total... ..	225	986	400	348	—	1703	200

Pour compléter le tableau nous devrions ajouter, au chiffre des ghafirs ordinaires, celui des ghafirs temporaires qui sont enrôlés quelques semaines durant, aux frais des preneurs de *schakh* ou de *chakfs*, afin de surveiller les opérations ; il n'est pas possible de le connaître exactement, le nombre de ces ghafirs variant presque de semaine en semaine, mais on ne se trompera pas en l'évaluant à près d'une centaine.

Affaires contentieuses. — Nous avons en, de même que chaque année, à défendre souvent les terrains antiques contre les empiètements des riverains, et plusieurs de ces affaires mettent en jeu des intérêts considérables : je citerai comme exemple celle des *tells* de Haou contre Khalafallah bey et ses loirs. Les poursuites contre les particuliers, pour fouilles illicites ou pour vol d'antiquités, ont été assez nombreuses, et, vu l'insuffisance des lois existantes, ou plutôt vu la mollesse avec laquelle les lois existantes sont appliquées, la plupart d'entre elles n'ont point abouti. Toutefois, à Louxor, deux cas se sont présentés où nous avons obtenu pleine satisfaction.

Le premier a trait au vol de deux statues provenant de la *javissa* de Karouk. Pendant la nuit du 16 au 17 janvier, des malfaiteurs escaladèrent le mur d'enceinte qui protège la maison de M. Legrain au sud, et, perçant la muraille de la maison même, ils s'y introduisirent. Ils se proposaient d'enlever deux statues dont la découverte avait ému beaucoup les marchands d'antiquités de Louxor, l'une d'elles passant pour être en *racine d'émeraude* et pour avoir, par conséquent, une valeur marchande inestimable. Toutefois, M. Legrain, par une sorte d'instinct prémonitoire, les avait déplacées la veille même, et il leur avait substitué deux statuettes de style médiocre : ils saisirent celles-ci, et, croyant leur coup réussi, ils se retirèrent par le même chemin, sans toucher aux objets voisins. Les soupçons se portèrent aussitôt sur les ghafirs, et trois de ces derniers, Ibrahim Abdel-Kader, Tewfik Abdel-Bari, Moustapha Hamuadi, qui nous avaient été fournis par l'Omdah d'un des villages de Karouk, furent mis en état d'arrestation. On constata à les examiner, qu'ils portaient aux épaules et aux bras, des écorchures fraîches, qui ne pouvaient s'expliquer que par leur passage à frottement dur dans la brèche du mur ; on reconnut d'ailleurs qu'ils avaient déjà subi plusieurs condamnations pour vol. L'instruction ouverte par le chef du parquet de Louxor, Saad bey el-Arsani, et par le mamour markaz, Mahmoud Effendi Fahmy Koutrizadeh, prouva bientôt que les deux statues avaient été cachées d'abord dans la maison d'un certain Chaât Osman, près du pylône de Khonsou, puis qu'elles avaient été transportées le lendemain 17, de grand matin, dans la ferme du frère de Chaât, Abdel-Hakim Osman, au Torah-el-Tahtamieh. Le 1^{er} février, une perquisition opérée en cet endroit amena la découverte des deux pièces et l'arrestation des recelleurs. Le 16 février, les accusés comparurent devant le tribunal de Louxor présidé par Ibrahim bey Zéki, et ils s'entendirent condamner, Moustapha Hamuadi, Chaât Osman et Ibrahim Abdel-Kader en trois ans de travaux forcés ainsi qu'en deux ans de surveillance, Tewfik Abdel-Bari en trois ans de travaux forcés, Abdel-Hakim Osman en deux ans de travaux

forcés. Ils appelèrent aussitôt du jugement, mais la cour du Caire confirma les peines infligées aux quatre premiers; toutefois elle acquitta Abd el-Hakim Osman au bénéfice du doute.

Vers la fin d'avril, deux des enfants employés à nos travaux, Saïd Mohammed et Abd'ul-Mérid el-Kénaoui, se laissèrent séduire aux promesses d'un marchand d'antiquités de Karnak, le nommé Yasin Mahmoud, et ils dérobèrent trois statuettes sans valeur. Ils le firent si maladroitement qu'ils furent saisis et emprisonnés aussitôt. Lorsqu'ils comparurent en justice, M. Legrain implora pour eux l'indulgence et pria le tribunal de garder toute sa sévérité pour le marchand qui les avait débauchés. Le juge fit droit à cette requête, et, profitant du rétablissement des peines corporelles, il infligea dix coups de canne de jonc à Saïd Mohammed et à Abd'ul-Mérid, mais vingt-cinq à Yasin Mahmoud.

Je suis d'autant plus heureux d'enregistrer ces deux faits, qu'ils viennent à l'appui d'une opinion que j'ai émise depuis longtemps. La législation actuelle de l'Égypte, si l'on consentait à l'appliquer aux délits commis contre les antiquités, contient assez de dispositions capables d'assurer une répression efficace dans presque tous les cas de ce genre. Par malheur, beaucoup parmi les administrateurs et même parmi les magistrats sont enclins à considérer que les antiquités ne constituent pas une matière à délits aussi caractérisés que les délits ordinaires, et ils manifestent une indulgence extrême vis-à-vis des coupables. J'ai entendu moi-même, quelques jours après le jugement rendu dans l'affaire des deux statues volées, un juge et un officier de police provinciaux déclarer que le tribunal de Louxor s'était montré d'une sévérité outrée et exprimer l'espoir que la peine serait très réduite en appel, peut-être même l'acquiescement prononcé. J'eus beau leur démontrer que le vol s'était compliqué de toutes sortes de circonstances aggravantes, notamment d'effraction et d'abus de confiance, je ne réussis pas à les convaincre, tant le préjugé est ancré dans la plupart des esprits. La fermeté que la magistrature de Louxor a déployé mérite donc d'être signalée, et je suis heureux de dire que le Ministère de l'Intérieur a bien voulu, à ma recommandation, récompenser d'un grade le zèle dont le mamour de Louxor a fait preuve dans ces deux affaires.

II. — LES FOUILLES ET LA RÉFECTION DE MONUMENTS.

Les fouilles des savants étrangers ont continué avec un plein succès. M. Flinders Petrie et ses attachés, MM. Ayrton et Loat, ont opéré dans les ruines d'Ahuas-el-Medineh et de Sediment-el-Gebel : ils ont mis au jour des parties nouvelles du temple déconvert à Ahnas par Naville, il y a une dizaine d'années. MM. Grenfell et Hunt ont repris leurs

recherches à Balnèsah, sur le site de l'antique Oxyrrhynchos, et ils y ont recueilli une moisson abondante de papyrus grecs. M. John Garstang a terminé l'exploration des puits creusés aux étages inférieurs de la colline à Benî-Hassan ; la plupart d'entre eux étaient vierges, et ils lui ont rendu presque intact le mobilier funéraire qui leur avait été confié lors de la mort du propriétaire. M. N. de G. Davies a presque achevé de copier les tombeaux septentrionaux d'El-Anarua, pour le compte de l'*Archeological Survey of Egypt*. Lady William Cecil a ouvert en face d'Assouan plusieurs tombes des princes d'Éléphantine qui vivaient sous le premier et sous le second empire thébain, mais les termites y avaient dévoré presque tous les objets en bois, et même ils avaient par places attaqué la peinture. Enfin M. Mond a déblayé une douzaine des plus beaux hypogées de Cheikh Abd-el-Gournah, qui ont été aussitôt munis de portes par les soins du Service et qui demeureront désormais accessibles aux voyageurs.

M. Reisner a concentré sur deux points l'activité de la mission qu'il dirige aux frais de Mrs. Hearst, dans l'intérêt de l'Université de Californie. Tandis qu'il s'en remettait à M. Lythgoe du soin d'achever la reconnaissance des cimetières archaïques de Nagah-el-Deir, en face de Guirgeh, il commençait lui-même, avec la collaboration de M. Mace, l'exploitation méthodique des portions de la nécropole de Ghizeh qui lui avaient été remises l'an dernier. Il a déblayé de fond en comble les mastabas qu'il avait attaqués, et bientôt, grâce à lui, nous aurons tout un quartier de ville funéraire libre des sables, tel qu'il était dans le temps que les grandes pyramides furent construites.

Les fouilles allemandes ont été poussées avec moins de vigueur peut-être que les années précédentes ; elles n'en n'ont pas moins obtenu des résultats brillants, surtout à Achmonnein, où M. Rubensohn s'est procuré un lot important de papyrus. C'est sur Achmonnein également que les Italiens ont porté leur attention pendant quelques semaines ; mais ils ont remporté leurs succès principaux à Thèbes et à Héliopolis. A Thèbes, dans la Vallée des Reines, ils ont vidé les tombeaux découverts l'an passé, et ils nous les ont livrés : nous avons mis des portes aux principaux d'entr'eux et nous les avons ouverts partiellement au public. A Héliopolis, M. Schiaparelli a dégagé des alluvions un très curieux édifice en briques sèches, dont le plan au moins doit remonter à une haute antiquité. Il est malaisé d'en définir complètement les dispositions et l'usage : toutefois il n'a paru y discerner les traits d'une *ouârit*, un de ces tertres artificiels où les grandes cités de l'Égypte cachaient le tombeau et la relique qu'elles possédaient d'Osiris. La campagne de l'hiver prochain lui permettra, je l'espère, de décider si cette hypothèse

est correcte. J'ajouterai que la maison d'études, pour laquelle le Gouvernement allemand avait sollicité l'an passé une concession de terrain à Cheikh Abd el-Gournah, a été achevée au mois d'octobre et inaugurée le 24 décembre. Le premier hôte en a été M. Sethe, professeur à Göttingen, et l'un des savants les plus distingués de l'école égyptologique de Berlin.

Les Français ne sont pas restés en arrière de leurs confrères des autres nations européennes. Le directeur de l'Institut Français d'Archéologie, M. Chassinat, a relevé les tombeaux d'El-Ghattah avec le concours de trois des membres, MM. Piéron, Gantier et Deiber. M. Piéron a consacré plusieurs semaines à copier les inscriptions de diverses chambres du grand temple d'Edfon, qui avaient été négligées par M. de Rochemonteix et dont l'absence arrêtait la publication commencée par ce dernier ; il a de plus étudié les procédés de construction mis en œuvre par les architectes de l'âge ptolémaïque. M. Gayet a persévéré dans l'exploration des cimetières chrétiens et païens d'Antinoë, et M. Gustave Lefebvre, membre de l'École d'Athènes, aidé de M. Barry, membre de l'Institut Archéologie, a mené brillamment les travaux de Tehneh. Il a déblayé un héli-spéos d'époque romaine, consacré aux dieux Sokou et Annon, un portique qui le précédait et une voie triomphale qui y conduisait à travers la ville : des bases, avec dédicaces en langue grecque, jalonnaient cette voie de droite et de gauche, mais les statues qu'elles portaient ont été détruites ou enlevées dès les temps anciens. Les ruines des maisons ont fourni une récolte assez heureuse de papyrus coptes et grecs.

Les opérations du Service ont, cette année du moins, dépassé celles des savants étrangers, par leur étendue et par l'importance de leurs résultats. Elles ont porté surtout sur la réfection et sur la conservation des monuments, mais elles ont amené la découverte d'une quantité de statues et de stèles très considérable. Nous n'avons fouillé vraiment que dans la nécropole Memphite, pour laquelle le Ministère des Travaux Publics a bien voulu nous ouvrir, en cours d'exercice, un crédit extraordinaire de L.É. 500. M. Barsanti, à qui la direction des chantiers avait été confiée, a terminé le dégagement du téménos de la Pyramide d'Onnas : les visiteurs ont désormais sous les yeux un bon exemple de ce qu'était l'ensemble d'un tombeau royal sous l'empire Memphite, pyramide, chapelle, enceinte dallée, souterrains, le tout ruiné malheureusement, mais suffisamment conservé pour corriger les conceptions courantes sur la nature de ces monuments. Certaines idées que j'avais émises, et qui ont guidé M. Barsanti pendant les cinq campagnes que ce travail a exigées, ont été reconnues assez exactes pour que je n'aie plus senti

la moindre hésitation à les appliquer aux autres pyramides de Sakkarah, et à conclure que la plupart de celles-ci avaient été bâties sur l'emplacement d'anciens tombeaux thinites. J'ai donc combiné la recherche de ces restes archaïques avec l'exécution d'un plan plus général pour le déblaiement complet des cimetières. Le site choisi a été celui qui s'étend entre la plaine d'une part, les fouilles de Loret et les pyramides de Têti et d'Assi de l'autre, mais la campagne de cette année a été consacrée tout entière aux préliminaires de l'entreprise. M. Barsanti a creusé la tranchée par laquelle notre voie Decauville doit passer pour aller jeter les déblais à la plaine, puis il a attaqué les buttes de décombres qui obstruaient la face est de la pyramide de Têti et qui atteignaient la hauteur de douze mètres : il a constaté l'existence aux points prévus de la chapelle funéraire et des souterrains de l'époque thinite. Une collection de stèles recueillies dans le sable nous apprend que, sous le second empire thébain et plus particulièrement sous la XIX^e dynastie, le vieux Pharaon Memphite recevait un culte avec le titre de Ménéphthah. Le manque d'argent risquait d'arrêter ces travaux, mais la libéralité du Gouvernement Égyptien nous a délivré de tout souci à cet égard. Il a décidé à nouveau que les nécropoles de Sakkarah, de Dahchour et de Licht demeureront le monopole du Service, et que, pour nous en rendre l'exploration possible, une somme de L.É. 1.000 nous serait allouée annuellement pendant le laps de temps nécessaire. Comme de plus M. Barsanti, trop distrait par les réfections de temples qu'il accomplit si bien dans la Haute Égypte, ne pouvait plus se vouer entier à Sakkarah, il m'a, comme je l'ai mentionné plus haut, autorisé à rappeler M. Quibell de Thèbes, et à créer un quatrième poste d'inspecteur en chef pour que la protection des monuments thébains ne fût pas compromise par le départ de M. Quibell. Nous pourrions désormais mener nous-mêmes les recherches que nous aurions été obligés d'abandonner à d'autres, et je ne doute pas que l'exécution de notre plan n'entraîne à brève échéance la découverte de monuments précieux remontant aux âges les plus reculés de l'Égypte.

La pyramide de Zaouiet-el-Aryân et le cimetière qui l'environne avaient naguère attiré mon attention. Après avoir essayé d'ouvrir la pyramide en 1883, j'avais dû y renoncer faute d'argent; en 1900, j'avais repris la campagne avec les ressources nécessaires, et M. Barsanti avait pénétré dans les chambres intérieures, mais il les avait trouvées vides et sans apparence qu'elles eussent jamais servi. Malgré cet échec, je ne pouvais oublier que Mariette avait recueilli au voisinage quelques-unes des pièces les plus anciennes du Musée, et je résolus de tenter un dernier effort. Vers la fin d'avril, M. Barsanti attaqua à la fois un mastaba

d'apparence archaïque situé dans la plaine sablonneuse, non loin du Sphinx et un site encombré de débris de granit et de pierres, qui dessinaient sur le sol un rectangle assez vaste. Son départ de congé ne lui permit pas de mener jusqu'au bout la première de ces fouilles: M. Daressy, qui l'acheva, reconnut qu'elle nous reportait à l'époque thinite, et il ramassa dans les chambres, avec les fragments d'une quantité de vases en pierre dure, de fort beaux outils en silex et des bouchons de jarre qui portent le nom du roi *Serpent*. La seconde fouille, exécutée par M. Barsanti avec l'aide du réis Ibrahim Fayed, nous révéla l'existence d'un puits énorme, taillé dans le roc et dont les parois étaient enduites d'un crépi blanc jusqu'à la profondeur d'environ vingt mètres, rouge dans les portions les plus basses. Il semblait que nous eussions là le plan d'un tombeau royal analogue à celui que la pyramide à degrés de Sakkarah recouvre, et de fait, dans les derniers jours de décembre, des blocs immenses de granit apparurent, soit le dallage d'une chambre funéraire détruite, soit les architraves ou les poutres qui formaient le toit d'une chambre funéraire intacte. J'ouvris aussitôt à M. Barsanti un crédit nouveau de L.E. 200, et je l'autorisai à faire venir de Sakkarah une partie de notre train Decanville, afin de hâter l'extraction des sables: l'avenir nous dira si son ardeur l'a mené à un succès ou à l'un de ces mécomptes si fréquents dans notre métier.

Les travaux de réfection ont été poussés avec plus de vigueur encore que l'an dernier. A Philæ, je suis heureux de constater qu'ils ont été presque nuls: le chiffre total des réparations, qui ne montait pas à L.E. 10 l'automne passé, n'a été de P.E. 35 cet automne-ci, auxquelles il faut joindre environ L.E. 7 pour les lavages à grande eau nécessités par l'efflorescence du salpêtre en mai et juin derniers. Les expériences instituées à ma demande par M. Fourtau, le géologue bien connu, nous permettent d'affirmer dès à présent que le grès dont les édifices sont bâtis, non seulement ne se délite pas comme nous le craignons, mais qu'il se raffermirait et qu'il recouvre, pour le moins au début, sa dureté première. La bonne impression que l'épreuve de l'année précédente nous avait laissée a donc été fortifiée par l'épreuve de cette année, et nous avons de plus en plus lieu d'espérer pour le mieux: si le pittoresque du site est perdu, il y a chance que les monuments persistent longtemps, sans trop de dommage, dans les conditions nouvelles où le barrage les a placés.

La reconstruction du mur occidental du temple d'Edfon n'a été achevée dans les derniers jours de décembre 1904, par M. Barsanti. Elle s'était poursuivie sans incidents pendant les trois premiers mois de l'année, et M. Barsanti avait profité de la présence sur les lieux d'un matériel

abondant et d'un personnel exercé, pour rajuster le plafond du petit temple ainsi que pour reconvrir le sanctuaire du grand, et pour ramener le naos en gruit de Nectanébo, à sa place ancienne. La démolition des six maisons que nous avons achetées il y a deux ans en avant des pylônes, et l'enlèvement du *sébakh* sur lequel ces maisons étaient bâties, a donné du recul à la façade et a ramené au jour les restes de murs en pierre qui indiquent la présence d'un édifice inconnu : il est probable qu'avant peu nous devrons exproprier quelques-unes des maisons qui sont encore debout dans ce quartier du village. Quoi qu'il en soit de cette éventualité, et, quand même elle ne se produirait pas, nous ne sommes pas prêts d'en avoir fini avec Edfou : il nous reste à consolider les plafonds de la Salle Hypostyle, dont deux blocs se sont écroulés il y a trois ans, à en fermer les brèches, à rejointoyer au ciment une partie des murs extérieurs de la cella, peut-être à redresser le portique ouest de la Grande Cour, enfin à clore l'aire entière du temple par un mur de briques sèches : il nous en coûtera, je le crains, beaucoup de temps et beaucoup d'argent.

Il en ira de même à Kom-Oumbo. M. Barsanti a remonté jusqu'au plus petit fragment la moitié des blocs écroulés en 1902, et il ne lui sera pas difficile de remettre les autres en place au cours de la campagne prochaine, mais le poids des sables est trop redoutable sur deux des côtés du temple pour que nous puissions les y laisser. Il nous faudra entreprendre à bref délai ce qui aurait dû être fait au moment du déblaiement même, l'enlèvement du sable et des décombres, puis jeter le tout au Nil : nous dégagerons de la sorte le vieux mur d'enceinte, et nous déterrerons probablement quelque édifice inconnu, dans l'angle où s'élève la redoute construite en 1885.

M. Barsanti a exécuté également, à la fin de janvier et au commencement de février, avec le concours de M. Somers Clarke, les réparations indispensables aux hypogées d'El-Kab : les fragments de la paroi est du tombeau de Ranni, qui s'était écroulée en 1887, ont été rajustés et cimentés solidement. L'ensemble des dépenses s'est élevé pour ces divers travaux à L.E. 852 223 mil. réparties comme il suit :

									L.E.	M.
Edfou	{	Achat de maison .. .. .	..	..	..	..	..	..	281	750
		Restauration du mur .. .. .	..	..	..	..	..	..	428	792
Kom-Oumbo	..	..	..	..	..	..	..	..	124	681
El-Kab	..	..	..	..	..	..	..	..	14	000
Total.. .. .									L.E. 852	223

A Karnak, la campagne a été particulièrement féconde. M. Legrain avait reçu pour instructions de relever les onze colonnes de la Salle

Hypostyle jusqu'aux chapiteaux, d'aborder la réfection du sanctuaire de granit et des cours et chambres qui le séparent de la Salle Hypostyle, enfin de terminer l'exploration de la cour qui précède le troisième pylône, et dans laquelle les restes d'un édifice d'Aménôthès I^{er} avaient été découverts pendant l'hiver précédent : il lui avait été recommandé de descendre aussi bas que possible dans le sous-sol, si bien que rien ne lui échappât des débris de constructions antérieures ou des statues et des stèles hors d'usage, dont les architectes s'étaient servi comme de remblais lors des restaurations du temple. Il a accompli fidèlement les deux premiers points de ces instructions : les onze colonnes ont été relevées, chapiteaux compris, et trois colonnes nouvelles qui menaçaient ruine ont été mises en démolition ; l'antichambre du sanctuaire de granit a été nettoyée, et les blocs qui restent de la couverture ont été consolidés en partie ; enfin, les chapelles et les portiques du voisinage ont été nettoyés et les dernières caryatides de Thoutmôsis I^{er} redressées sur leurs pieds. L'exploration de la cour située en avant du septième pylône avait déjà amené, vers la fin de décembre 1903, la découverte d'une *jarissa* fort étendue, comme je l'ai exposé dans mon rapport précédent, mais ce ne fut qu'à partir du mois de janvier 1904 que la richesse de ce dépôt se manifesta d'une manière évidente. Pendant plus de six mois, M. Legrain se livra à une véritable pêche aux monuments dans cette fosse sans cesse élargie, et il y retira de l'eau 8.562 objets divers, parmi lesquels on remarque 457 statues et statuettes humaines en pierres de toute nature, 7 sphinx, 15 stèles, 1 clepsydre en albâtre, environ 8.000 Osiris en bronze, dont le plus grand ne mesure pas moins de 1m. 30 de haut. Quelques-unes de ces statues sont de véritables chefs-d'œuvre, celles d'Amenemhaït III, de Thoutmôsis III, d'Aménôthès II, de Toutankhamon, du grand prêtre d'Amon Ramsès-nakhton, du prince Montoumhaït ; presque toutes ont des inscriptions dont les données, se complétant l'une par l'autre, enrichissent les annales égyptiennes d'une multitude de noms et de faits nouveaux. C'est surtout l'histoire des grands prêtres d'Amon et de la révolution qui transforma l'empire militaire des Pharaons thébains en une principauté théocratique qui profite de cette abondance de documents ; nous possédons dès à présent assez de textes pour reconstituer la généalogie complète de plusieurs des grandes familles nobles, depuis les temps de la XX^e Dynastie jusqu'à ceux de l'invasion persane. Il semble qu'au III^e siècle avant notre ère, sous l'un des quatre premiers Ptolémées, les architectes chargés de restaurer le temple de Karnak, furent obligés de se débarrasser de tous les ex-votos, statues ou stèles, qui encombraient l'ancienne maison des grands prêtres et les cours qui l'avoisinaient ; ils en

enterrèrent une portion dans la *jarissa* que M. Legrain s'occupe à vider. D'autres enchettes du même genre existent à coup sûr et nous espérons les retrouver. Celle-ci n'est pas épuisée encore, et nous attaquerons les régions encore vierges de la cour, pendant la campagne de 1904-1905, dès que l'état de l'eau le permettra. Il faut remonter jusqu'aux débuts de Mariette et jusqu'à la découverte du Sérapéum pour rencontrer un site qui ait produit en une seule fois tant de monuments et de si importants.

J'ai raconté plus haut quelles convoitises notre aubaine avait soulevées parmi les marchands indigènes, et de quelles tentatives de vol la maison du service à Karnak avait été l'objet. Ces attaques auraient été plus nombreuses et couronnées de plus de succès si M. Legrain n'avait veillé sur les chantiers avec une constance qui ne s'est jamais démentie: c'est bien à lui que nous le devons si très peu de pièces nous ont été soustraites pendant l'extraction, et si nous possédons presque toute la trouvaille. Les travaux qu'il a dirigés ont coûté, du 1^{er} janvier au 4 juillet, et du 15 novembre au 31 décembre 1904 :

	L.E.	M.
Restauration et déblaiement	1451	096
Achats, réparations et transport matériel	381	310
Personnel	125	102
Divers	42	492
Total.. .. .	L.E. 2000	000

Je ne crois pas qu'en général il y ait avantage à évaluer l'importance d'une découverte scientifique selon la valeur vénale des objets qui la composent : je le ferai cette fois par exception, afin de rendre l'importance de la *jarissa* visible aux yeux les moins exercés. Estimées aux taux du marché actuel, nos statues seules dépasseraient aisément le prix de L.E. 30.000. Si l'on songe que c'est là le produit d'une seule année, et que l'ensemble des opérations aura coûté au trésor égyptien L.E. 12.000 en six ans, on confessaera volontiers que l'argent employé à ces travaux n'est pas de l'argent mal placé.

D'ordinaire la Basse Égypte fournit moins de gros monuments que la Haute: cette année-ci du moins nous aurons tiré d'elle un contingent très appréciable. Dès mon retour au service, j'avais rêvé de transporter au Musée les gros monuments que Mariette avait découverts à San, de 1859 à 1865, et qu'il avait dû laisser sur le sol, faute d'engins assez puissants pour les remuer. Ils étaient demeurés presque intacts jusqu'à ce jour, mais les progrès de la culture autour d'eux et surtout la construction de plus en plus probable d'une voie ferrée dans le voisinage étaient pour eux une menace perpétuelle. L'entreprise nécessitait

malheureusement beaucoup d'argent, 1000 L.E. au moins, et ce n'est jamais sans peine que nous nous procurons pareille somme : je réussis pourtant à la parfaire, en économisant L.E. 500 sur le produit des billets de touristes de 1903, et en prélevant les 500 autres livres sur le produit du même fonds en 1904. M. Barsanti fut chargé de l'exécution, avec le réis Khalil et l'inspecteur de Zagazig, Ali effendi Habib. La campagne dura trois mois environ, de la fin d'avril au 14 juillet, et elle marcha sans à coups, malgré les difficultés sérieuses qu'elle présentait. Il fallut en premier lieu déblayer et rassembler une quarantaine de grosses pièces, dont plusieurs pesaient plus de quinze tonnes, puis les monter sur nos plateformes Decauville et les transporter de San à la station de Kafr-Sakr où elles seraient chargées sur le chemin de fer de l'État. C'était une distance d'environ trente-trois kilomètres à parcourir, partie dans les ruines, partie sur les levées du Masraf San ; c'étaient trois ponts à jeter sur ce même canal, dont l'un d'une longueur de trente-cinq mètres, c'étaient enfin deux cents tonnes de monuments à embarquer sur le quai de Kafr-Sakr, sans machines et sans appareils autres que ceux que nous aurions fabriqués nous-mêmes. M. Barsanti exécuta le plus difficile de l'entreprise, par une chaleur torride et par une sécheresse qui rendaient le travail insupportable même à nos manœuvres indigènes, mais, sa santé, déjà éprouvée par de longs séjours au Saïd pour les restaurations d'Edfou, de Kom-Ombo et de Philæ, ne lui permit pas de persister jusqu'au bout. Il dut me demander un congé à partir du 3 juillet ; le transport fut achevé par le réis Khalil et par l'inspecteur Ali effendi Habib, sous la surveillance intermittente de M. Daressy et M. Quibell. Il avait coûté en tout L.E. 902 125 mill. réparties ainsi qu'il suit :

	L.E.	MILL.
Achat, réparations et transport du matériel	169	233
Transport des monuments	731	382
Divers	1	510
Total.. .. .	<u>L.E. 902</u>	<u>125</u>

Les colosses n'ont pas été placés encore dans les salles du Musée, faute d'argent : l'opération se fera au printemps de 1905, après le départ des touristes. Un des monuments les plus curieux parmi ceux que Mariette avait découverts, la stèle de l'an 400, paraît avoir disparu : tous les autres sont arrivés intacts, les soi-disant sphinx Hyksôs, les colosses de Mermentitou, ceux de Ramsès II, de Ménéptah et d'Ousirtasen, les naos monolithes de Ramsès II, la stèle de Taharkou. J'avais l'intention de ramener les onze obélisques dont les fragments jonchaient le

sol, et d'en redresser plusieurs en avant du Musée, mais les levées du Masraf Sân n'auraient pu porter le poids de quarante tonnes qu'atteignent certains de leurs fragments, et j'ai dû renoncer provisoirement à cette idée. Plus tard je profiterai des hautes eaux pour les charger sur des radeaux et pour les flotter sur les canaux puis sur le Nil jusqu'au Caire : j'espère que ce sera dans deux ou trois ans au plus tard.

Comme pour les années précédentes, il convient d'ajouter ici l'indication de quelques sondages ou de quelques transports exécutés au moment du *schakh* ou de l'inondation, dans plusieurs localités de la Haute et de la Basse Égypte. Tout compris, l'ensemble de nos dépenses, abstraction faite des sommes consacrées à Edfou et à Karnak sur allocation spéciale, a été, pendant l'année 1904, sur les deux chapitres *Fouilles* et *Compte Touristes*, ce qui suit :

		Compte Fouilles		Compte Touristes	
		L.E.	M.	L.E.	M.
	Sân	—	—	902	125
	Sakkara	308	355	55	054
	Zaouiet-el-Aryân	517	870	—	—
	Mit-Rahineh	14	800	—	—
	Abydos	—	—	526	698
Bilam el-Moulouk	{ Réparations, aménagements, etc.	25	740	10	242
	{ Frais d'électricité.	—	—	92	350
Cheikh Abd el-Gourna	{ Aménagement des tombeaux . .	—	—	112	153
	{ Fouilles	38	—	—	—
	Deir-el-Balri	—	—	15	115
	Ramesséum	—	—	201	880
	Medinet Habou	—	—	19	628
	Vallée des Reines	—	—	34	170
	El Kab	—	—	14	—
	Edfon	—	—	283	180
	Kom Ombo	—	—	124	681
	Assouan	—	—	275	755
	Éléphantine	5	120	—	—
	Philæ	—	—	6	435
	Divers	22	840	—	—
Totaux		L.E. 932	785	2.673	467

III. — LES MUSÉES ET LES PUBLICATIONS DU SERVICE.

Musée du Caire. — Les opérations de peinture et de meilleur aménagement commencées l'an dernier ont continué cette année avec succès, grâce à l'appui que la Direction Générale des Bâtiments de l'État a bien voulu nous prêter. La peinture des salles du rez-de-chaussée a été finie

en mars 1904, et, ainsi que je l'avais indiqué, nous avons pu réaliser quelques économies sur les L.E. 512 que j'avais prévues. Nous n'avons dépensé que L.E. 437,715; le petit excédent de L.E. 74,285 joint à un crédit nouveau de L.E. 550 qui nous n'étant pas été concédé, m'a permis de procéder pendant les mois de juillet, août, septembre et octobre, à la décoration des Salles d'Exposition du premier étage et de l'atrium central. Je l'ai conçue dans le même esprit que celle du rez-de-chaussée, avec des tons rouges, ivoirins et bleus, mais en changeant la proportion de ces tons de telle manière que, dans les salles à deux étages, la couleur de l'ensemble allât s'atténuant du sol au plafond. Une plinthe rouge d'un peu moins d'un mètre de hauteur rappelle dans les soubassements les fonds rouges du rez-de-chaussée. Au dessus de cette plinthe, deux tons d'ivoire, l'un à l'huile plus chaud et légèrement mêlé de rouge, l'autre à la détrempe et plus froid, séparés par une bande étroite de couleur discrète, montent jusqu'à la corniche. Celle-ci est relevée d'un motif bleu et rouge, emprunté à l'un des temples de Sélinonte et cerné d'une rangée de perles jaunes et noires. Au dessus, le plafond des salles et des lanterneaux est uniformément d'un bleu très pâle qui adoucit la lumière. J'ai conservé le même parti d'ensemble pour l'atrium central; toutefois j'y ai compris les corniches dans la teinte ivoirine de la muraille, et je n'ai mis de couleur qu'aux chapiteaux des piliers qui soutiennent le plafond, ou sur la platebande qui encadre les arceaux, prenant soin de pâlir les tons employés dans ces endroits de manière à ne pas gâter l'impression de hauteur que l'architecte avait voulu produire. Après plusieurs essais infructueux, je me suis résigné à adopter pour le soubassement de l'atrium une solution mixte qui ne me satisfait qu'à moitié. Les dispositions prises par l'architecte nous autorisaient à appliquer là un système différent de celui qui prévalait dans le reste : il suffisait, pour ne pas tomber dans le disparate, que la totalité générale en fût plus sombre que celle du rouge que nous avions choisi pour les salles. J'ai fait alterner l'imitation du grès rouge sombre du Gebel Almar avec celle des marbres de couleur, séparant les grès et les marbres par des imitations de gruit, à l'aplomb des piliers qui soutiennent les portiques latéraux. L'ensemble est assez réussi, et, bien qu'on en ait critiqué plusieurs points, on convient que l'effet général est plutôt satisfaisant. Les difficultés matérielles n'étaient pas médiocres, dans une salle où le plafond court à plus de vingt mètres au-dessus du sol, et il nous a fallu pour arriver à cette hauteur combiner des échafaudages et imaginer des précautions particulières. M. Perry, Directeur Général des Bâtiments Civils, a bien voulu nous ouvrir à cet effet un crédit spécial de L.E. 110, grâce auquel nous avons pu acheter les bois et construire les appareils:

ce sont des matériaux qui resteront à notre disposition pour des réparations éventuelles, ainsi que pour la décoration de la Galerie d'Honneur et du dome central. Celle-ci exigera une dépense plus forte, mais elle ne commencera qu'au printemps de 1904 après le départ des touristes.

En même temps, la Direction des Bâtiments Civils, remplaçant les garde-fous pleins de la Galerie et des escaliers d'Honneur par des balustrades en marbre blanc, construites avec les marbres que j'avais obtenu l'autorisation d'enlever au sémaïik du palais de Gizéh. Le travail devnit être terminé le 15 novembre au plus tard, mais l'entrepreneur, M. Berto, ayant commandé quelques mains courantes en Italie, l'achèvement n'a pas pu avoir lieu dans les délais prévus, et les balustrades de la partie Est de la galerie ne seront mises en place que dans les premiers mois de 1905. C'est aussi en 1905 qu'on substituera aux pavements en ciment un dallage en marbre blanc que j'ai rapporté de Gizéh, et qu'on supprimera les ouvertures ovales qui déparent les deux extrémités de la Galerie. Dès à présent, l'amélioration produite par ces modifications est sensible et enlève les suffrages de tous les visiteurs, mais la substitution du marbre au ciment a augmenté la charge des planchers du premier étage; il devient nécessaire de les étayer, si l'on veut éviter la flexion et peut-être des accidents de personnes un jour de foule. M. le Directeur Général des Bâtiments de l'État a consenti en principe à construire, aux quatre angles des poutres qui portent la balustrade presque ronde correspondante au dome, autant de piliers de maçonnerie combinés avec des colosses antiques; les détails du projet seront fixés en 1905, et l'exécution commencera aussitôt après le passage des touristes.

Au cours de l'été de 1904 j'ai essayé un système de volets en bois, peints à l'huile et saupoudrés de sable, destinés à atténuer la chaleur et la lumière trop vive qui pénètrent encore dans nos salles du premier étage par les vitrages latéraux des lanterneaux. J'ai réussi à déterminer par une série de tâtonnements, la place que chacun de ces volets doit occuper selon l'exposition des salles, et nous serons désormais en état d'abriter et d'éclairer les monuments à notre gré. Afin d'éviter des transports toujours dangereux, j'ai construit sur la terrasse, avec les fers provenant des anciens lanterneaux et que le Ministère a bien voulu nous donner l'an passé, deux hangars légers et invisibles de la rue, où ces volets seront remisés pendant les mois d'hiver.

Nos collections se sont enrichies cette année d'un nombre considérables d'objets, par suite surtout de la trouvaille de Karnak et de l'expédition de San : près de cinq cents statues et statuettes ont pris place dans les galeries du bas. Par malheur les travaux de peinture et d'amélioration m'ont empêché de procéder au classement définitif des monu-

ments. J'ai fait pourtant monter au premier étage, et dresser en avant de la rotonde septentrionale, la grille en fer ouvragé qui fermait la Salle dite du Monument Mariette au rez-de-chaussée. J'ai fait également fabriquer pour cette rotonde, par M. Altobello, notre menuisier, des armoires et des vitrines hexagonales en bois de noyer, sur un modèle élégant dessiné par Brugsch Bey et mieux compris que celui de nos armoires et des vitrines présentes. Je comptais y installer avant le mois de décembre nos bijoux qui sont à l'étroit dans la Galerie Est de la façade méridionale, mais je n'ai pas pu me procurer à temps les serrures de sûreté et les velours nécessaires. L'ouverture de cette Salle nouvelle, et, par suite, le transport de nos collections de silex taillés dans la Galerie où les bijoux étaient exposés ne pourront avoir lieu qu'après le départ des touristes, au printemps prochain; c'est à ce moment encore que nous nous occuperons de classer les objets contenus dans les Salles du premier étage et que nous procéderons à la revision de nos *Guides*. Je regrette plus que personne les retards apportés à ces opérations, mais il m'était impossible de commencer des travaux aussi délicats tandis que des peintres et des maçons étrangers avaient libre accès dans nos galeries: les armoires, ouvertes pendant le classement, auraient offert des tentations dangereuses à ce personnel que nous ne connaissons pas, et dont les entrepreneurs eux-mêmes ne sauraient répondre. Il faut qu'on nous fasse crédit quelque temps encore et qu'on ne s'impatiente pas trop si nos *Guides*, après deux et trois ans de remaniements incessants, ne répondent plus partout à l'état actuel du Musée.

La statue en bronze de Mariette Pacha, œuvre du maître sculpteur Denys Puech, est arrivée en Égypte dans les premiers jours de février, et elle a été dressée sur son piédestal, le 27 du même mois, par les soins de M. Barsanti. L'exèdre qu'elle domine, exécutée sur mes indications par Manescaleo Bey, architecte en chef du Ministère des Travaux Publics, et l'ensemble du monument ont été inaugurés en grande solennité, le 17 mars, devant une assistance nombreuse qui comprenait, outre les Ministres de S.A. le Khédivé et l'Agent Diplomatique de France, M. de la Boulinière, tous les représentants des puissances étrangères en Égypte et les membres principaux des colonies étrangères du Caire. Le Ministère des Travaux Publics nous avait ouvert à ce sujet un crédit spécial de L.É. 200, dont 120 furent employées aux frais de la réception et 80 remises à MM. Alfred et Edouard Mariette, fils et frère du grand Égyptologue, pour leur permettre d'assister à la cérémonie. Le matin même, la Direction du Tanziin avait fait placer, à l'angle Nord de la rue qui borde le Musée à l'Est, des plaques au nom de Mariette Pacha, et cette marque d'attention reconnaissante a été hautement appréciée par les Français qui assistaient à la glorification de leur illustre compatriote.

Musée d'Alexandrie. — En exécution du décret qui règle l'organisation du Musée d'Alexandrie, la Municipalité de cette ville avait présenté au Ministère des Travaux Publics, pour succéder à M. Botti, M. Breccia, professeur à l'Université de Rome, qui avait opéré des fouilles en Égypte au cours des deux années précédentes, sous la direction de M. Schiaparelli, aux frais du Gouvernement Italien: la Direction des Antiquités a été heureuse d'approuver un choix aussi remarquable, et, à la date du 1^{er} avril, le Ministère des Travaux Publics nomma M. Breccia au poste de Conservateur. L'arrivée d'un homme actif et instruit a imprimé un vif élan aux affaires du Service, et elle a produit les meilleurs effets pour la reconstitution du Musée d'Alexandrie.

Les bâtiments de ce Musée étaient en état d'agrandissement au moment où M. Botti mourut. La Municipalité venait de les compléter par une aile nouvelle comprenant un vaste salon carré, une galerie, trois cabinets, une chambre avec sous-sol dominant sur la cour, le tout réuni à l'aile ancienne par un portique ouvert, destiné aux monuments de grande taille et qui ne craignent pas le plein air. Il fallait garnir ces salles, et M. Breccia profita de l'occasion pour classer les collections sur un plan plus scientifique que celui qui avait prévalu jusqu'alors. Il réserva toute la partie de l'aile, à droite de l'entrée, aux antiquités byzantines ou coptes et aux monnaies. L'aile gauche reçut le *Lapidarium*, les manuscrits sur papyrus et les ostraca, les stèles funéraires avec ou sans inscriptions. Les antiquités égyptiennes proprement dites gardèrent leur place primitive dans les quatre cabinets qui suivent le *Lapidarium*, et au-delà se développa la série des monuments de l'époque gréco-romaine qui, tout en respectant les traditions principales de l'art indigène, ont emprunté quelques-uns de leurs éléments constitutifs à l'art hellénique. Les dernières salles appartiendront : 1^o à la petite sculpture ainsi qu'à l'iconographie des Ptolémées et des Césars, 2^o aux statues, 3^o aux fragments d'architecture, 4^o aux momies, aux cercueils, aux urnes cinéraires, au matériel funéraire de l'âge gréco-romaine, 5^o à la céramique, à la verrerie, aux petits bronzes, et, d'une manière générale, à tous les menus produits des arts industriels. Le jardin recevra des tombeaux complets et toutes les pièces qui, pour leurs dimensions ou pour leur poids, ne sauraient être enfermées dans l'intérieur. Ces plans sont en pleine voie d'exécution ; au fur et à mesure que les salles se remplissent, M. Breccia rédige un inventaire détaillé qui est conçu sur le modèle de notre grand catalogue, et qui sera, je l'espère, imprimé bientôt à la suite de nos volumes.

Les collections se sont enrichies, depuis le 1^{er} avril, d'un assez grand nombre d'objets importants provenant soit d'Alexandrie ou des envi-

rons, soit des réserves du Musée du Caire : une inscription bilingue, grecque et latine, de l'an XI d'Auguste, où l'on raconte la construction d'une rigole qui amenait l'eau du Nil du bourg de Schédia à Alexandrie ; la base en marbre d'une statue de Valentinien I^{er} ; une belle réplique en marbre, malheureusement sans bras ni tête, d'une statue, aujourd'hui perdue, qui rappelle la Danaïde Varienne ; un bas-relief en marbre, représentant St-Ména entre les deux chameaux légendaires ; des vases à vernis noir, des urnes cinéraires peintes, des figurines en terre cuite du type de Tanagra, de petits boucliers votifs, des bucranes et des têtes de Méduse en plâtre doré. On sait que nous envoyons à Alexandrie les monnaies qui tombent entre nos mains. Le cabinet des Médailles a prospéré sous l'habile direction de M. Dutilh. Il y est entré récemment, par voie d'achat, d'échange ou de don gracieux, cent cinquante pièces grecques, pour la plupart de beaux tétradrachmes Ptolémaïques assez rares et d'une conservation parfaite. Les séries relatives à la domination romaine se sont augmentées de plusieurs pièces insignes : quatre monnaies de nomos ; un moyen bronze, unique jusqu'à présent, de l'an XV, avec le buste, tourné à gauche de Faustine, jeune femme de Marc Aurèle César ; un grand bronze de Lucilla, femme de Lucius Vêrus. La série byzantine a marché très rapidement, et elle s'est élevée en 1904 d'une cinquantaine de pièces en or à cent trente environ, grâce surtout aux envois que nous avons faits à M. Dutilh. Les mesures que j'ai prises, pour obtenir une surveillance plus exacte des travaux de construction et d'enlèvement des *chakfs*, ont eu pour résultat d'amener au Musée quelques-unes des pièces qui, auparavant, se perdaient toutes entre les mains des ouvriers et des entrepreneurs de bâtisses : nous espérons que les effets en deviendront plus heureux d'année en année.

Catalogue Général, Publications, Bibliothèque. — Nos publications ont suivi cette année encore la marche ascendante que je signalais dans mes rapports antérieurs. Cinq volumes du fascicule de notre grand Catalogue ont paru : le second fascicule des *Sarcophages* de Lacm, les *Bronzes* d'Edgar, le premier volume des *Textes Démotiques* de Spiegelberg, le *Tombeau de Thoutmôsis IV* de Carter et Newberry. Onze autres sont sous presse : le deuxième volume des *Sarcophages* de Lacm, le deuxième volume des *Textes démotiques* de Spiegelberg, les deuxième et troisième volumes des *Stèles du Moyen Empire* de Lange-Schäfer, les *Objets Archaiques* de Quibell, les *Inscriptions grecques et latines* de Milne, la *Ferrerie* et les *Modèles* d'Edgar, les *Stèles hiéroglyphiques de l'époque grecque et romaine* d'Ahmed Bey Kautal, les *Vases en pierre*

de Bissing, la *Seconde trouvaille de Deir-el-Bahari* de Chassinat. Dix enfin sont en préparation: les *Statues et statuettes des divinités* de Daressy, les *Tables d'offrandes* d'Ahmed Bey Kamal, les *Scarabées et les Statuettes funéraires* de Newberry, les *Ponts* de Weigall, la *Faune momifiée* de Gaillard et Daressy, les *Papyrus funéraires* de Dyroff, les *Cercueils en bois des époques nubastite et saïte* de Moret, les *Stèles du Nouvel Empire et de l'époque saïte* de Lacau, la *Trouvaille de Karnak* de Legrain. MM. Dyroff, Moret et Weigall, de passage en Égypte, nous ont prêté leur concours pendant quelques mois aux conditions usuelles: j'ai pu m'assurer pour l'hiver de 1904-1905 l'aide de MM. Moret, Bénédite et Spiegelberg. On voit que l'œuvre va bon train. Les frais en ont été couverts, comme d'habitude, par le crédit annuel de L. E. 2000 que la Caisse de la Dette nous avait ouvert à cet effet, et par les économies que j'ai pu réaliser sur les annuités antérieures de ce crédit. La régularité avec laquelle les volumes paraissent a encouragé les acheteurs, et les ventes opérées par nos trois libraires, Hiersemann, Leroux et Quaritch, nous ont rapporté cette année-ci L. E. 584,650, qui, versées à notre fonds des publications, nous permettront d'assurer l'impression et de pourvoir à la rédaction des volumes nouveaux.

Dans le même ordre d'idées, je suis heureux d'annoncer que M. Ducros a commencé la mise sur fiches des monuments décrits dans notre *Catalogue Général*. Il a déjà rédigé plus de quatre mille fiches, comprenant les volumes parus de MM. de Bissing, Daressy, Grenfell et Hunt, etc. Il manque encore à chaque fiche l'indication de la place occupée par le monument dans notre Musée actuel: cette mention sera ajoutée plus tard, quand nous aurons achevé le classement de nos salles. Pour faciliter l'opération, j'ai fait établir par M. Baraize un plan de chaque salle, et, dans chaque salle, de chaque paroi, sur lequel sont marqués les monuments qui la remplissent, chacun avec le numéro qu'il porte au *Catalogue Général*. Lorsque ces plans seront terminés, et que le répertoire en aura été dressé, il sera facile, en combinant avec les données qu'ils apportent les données consignées sur les fiches, de retrouver en quelques minutes le site exact de n'importe quel monument dans le Musée.

Les *Annales du Service* ont terminé leur cinquième volume. J'essaie d'y multiplier les planches, de manière à montrer à nos lecteurs, par l'image, les plus intéressants des monuments découverts en Égypte au cours de l'année, mais le développement même que j'ai donné à cette partie de nos publications m'a valu des critiques. La numérotation des planches ne court pas d'une manière uniforme d'un bout à l'autre du

volume; elle recommence dans chaque volume avec chaque mémoire nouveau, et on me l'a reproché. En principe, ceux qui blâment cette façon de procéder ont raison, mais peut-être devraient-ils se demander s'il nous était possible d'en agir autrement. Nous sommes forcés de faire exécuter nos planches en Europe, ce qui exige un temps considérable et nous expose à des retards incalculables, pour cause de grèves ou d'accidents de mer. De plus, beaucoup de nos collaborateurs ne résident pas en Égypte et ne nous renvoient pas leurs épreuves de façon régulière. Si nous voulions paraître exactement, nous devons insérer les mémoires non point selon un ordre fixé à l'avance, mais selon l'ordre où nous recevons les planches et les épreuves corrigées. On comprend que, dans ces conditions, il n'y a pas moyen d'attribuer un classement suivi à toutes les planches d'un même volume : pour en agir de la sorte, il nous faudrait attendre le retour de toutes les planches ou de toutes les épreuves d'un mémoire avant de passer au mémoire suivant, et nous risquerions de retarder indéfiniment l'apparition de certains de nos fascicules. Nous ne serons en état de remédier à cet inconvénient que le jour où nous aurons en Égypte des lithographes et des graveurs capables de nous fournir les planches que nous sommes contraints de demander à l'Europe.

Le second fascicule du tome II de *Kom-Ombo*, par M. de Morgan, est terminé, et le troisième est sous presse. Le premier fascicule du tome II du *Musée Égyptien* a paru, comprenant 17 planches et 6 feuilles de texte. Une première livraison du grand plan des Nécropoles thébaines, dressé par M. Baraize a vu le jour. Elle comprend en cinq feuilles la colline de Cheikh Abdel-Gournah presque complète; la prochaine donnera le Ramesseum. Enfin, la traduction en arabe, par Ahmed bey Kamal, de notre Guide au Musée du Caire, a été mise en vente au mois d'août; elle a obtenu un succès véritable parmi les visiteurs indigènes.

Notre bibliothèque s'est enrichie, par achat, par don gracieux ou par échange, d'environ deux mille volumes ou brochures. Il a fallu commander des armoires nouvelles pour recevoir ces acquisitions, et l'étage inférieur du local qu'elle occupe est entièrement garni : nous nous occuperons l'an prochain de meubler l'étage supérieur. M. Ducros, notre bibliothécaire provisoire, a classé les livres d'une manière méthodique et commencé la rédaction de notre Catalogue sur des fiches du type de celles que j'ai choisies pour le Catalogue Général des monuments : dès qu'il aura fini cette opération, je le chargerai du classement des archives de notre Musée.

Exposition Universelle de Saint-Louis. — Le 20 janvier 1904, M. Quibell, chargé d'organiser la subdivision antique de la Section Égyptienne à cette Exposition, quittait l'Égypte. Grâce à la précaution que j'avais prise d'expédier un matériel tout préparé d'armoires et de vitrines, il réussit à ranger promptement, dans les deux grandes salles qui nous avaient été concédées, les groupes de mannequins représentant les scènes de la vie Pharaonique et les collections d'objets et de monuments que j'ai indiquées dans mon rapport de l'an dernier: le jour de l'ouverture, notre section faisait bonne figure parmi les rares sections accessibles au public. Le succès n'était considérable pendant tout l'été: le jury des récompenses l'a consigné en accordant un grand prix à l'ensemble de l'Exposition et deux médailles d'or au Directeur du service et à M. Quibell. A la fermeture, une partie des collections ont été vendues à des Universités et à des particuliers pour la somme totale de L.É. 932; nous avons dû rapporter le reste et abandonner les mannequins, qui avaient souffert grandement pendant les divers transports dont ils avaient été l'objet. Elles nous avaient coûté environ L.É. 1.500 à préparer ou à réunir et plus de L.É. 1.000 pour le transport, l'installation et le gardiennage: en somme nous avons recouvré un peu plus que la moitié de la valeur des objets.

En terminant, voici l'état comparatif de nos recettes hors budget pour les deux saisons 1902-1903 et 1903-1904.

NATURE DES RECETTES.	1902-1903.		1903-1904.		En plus pour 1903-1904.		
	L.É.	M.	L.É.	M.	L.É.	M.	
Touristes..	3,951	100	5,009	100	1,058	200	
Salle de vente..	1,050	885	2,476	100	1,425	515	
Entrée au Musée	714	090	1,003	170	289	080	
Publications	Publications..	574	052	584	650	10	578
	Chakfs et divers	513	841	581	711	37	903
TOTAL..	6,833	988	9,655	364	2,821	376	

Ces chiffres appellent quelques observations. Le produit de la vente des billets accuse un total de 4357 touristes ayant visité la Haute Égypte, 3688 à plein tarif (L.É. 4.401, 600 mill.), 669 à demi-tarif (L. É. 468, 300 mill.) et seulement 2790 personnes ayant visité Sakkarah (L.É. 139, 500 mill.). Ces chiffres, le dernier surtout montrent

sur quelle échelle la fraude s'exerce à notre égard : le fond des touristes est de ceux qui s'augmenteront beaucoup encore. Les entrées ont été, pendant l'hiver, de 18,180 (L. E. 909) ; pendant l'été, sous le régime du tarif réduit, de 9,367 (L. E. 93, 670 mill.) plus un abonnement, en tout 27,548 personnes. L'huissier européen que nous avions préposé au service des entrées nous a dérobé L. E. 96 aux mois de février et de mars, et il a été de ce chef condamné à deux mois de prison par le tribunal consulaire de Danemark. C'est là heureusement un fait exceptionnel, et d'ordinaire la fraude trouve peu à s'exercer ici. Je ne pense donc pas que le produit de cette source de revenus s'accroisse beaucoup : les visiteurs atteindront à comp sûr le chiffre de 30.000 par an, mais ils ne le dépasseront pas avant quelques années. Il est certain, d'autre part, que la vente de nos publications ira en augmentant à mesure que le *Catalogue Général du Musée* progressera, mais il m'est impossible de prévoir dans quelles proportions. J'incline à croire que nous n'irons guère au delà de L. E. 700 ou 800 au plus ; encore ne maintiendrons nous ce chiffre que si, après achèvement du *Catalogue Général du Musée*, nous réussissons à continuer dans de bonnes conditions le *Catalogue Général des monuments*. Le revenu de la vente des *chakys* serait susceptible de s'accroître presque indéfiniment pendant quelques années, si nous parvenions à organiser régulièrement la surveillance : il nous faudrait pour cela un personnel que nous ne posséderons jamais, et nous devons nous estimer heureux si nous augmenterons nos recettes de L. E. 150 ou 200 par an au cours des dix années qui suivront. Enfin, on ne devra pas croire que nous puissions maintenir le rapport de la salle de vente au taux que nous avons atteint cette année. L'augmentation de L. E. 1.425, 515 mill. que notre tableau enregistre tient à ce que nous avons cédé plusieurs mastabas complets à des Musées d'Europe ou d'Amérique. Rien ne nous dit que les autres Musées songeront de longtemps à de telles acquisitions, et il est probable que, dès 1905, la vente des Antiquités se restreindra presque entièrement aux menus objets que les touristes ont l'habitude d'emporter avec eux comme souvenirs de leur voyage : je ne serai pas trop étonné si de L. E. 2.476, 400 mill. auquel il s'est élevé en 1904, le produit de la salle de vente retombe l'an prochain aux L. E. 926, 510 mill. que nous encaissions en 1901-1902. J'espère toutefois que cette décreuse subite sera compensée par un accroissement notable sur nos autres ressources, et que les recettes de la saison 1904-1905 ne le céderont pas à celles de la saison 1903-1904.

Assouan, le 30 décembre 1904.

G. MASPERO.

REPORT ON AGRICULTURAL RAILWAY LINES

1904

BY

JAMES A. GUNN.

REPORT ON AGRICULTURAL RAILWAY LINES.

Cairo, 30th March, 1905.

THE ADVISER,
Ministry of Public Works,
Cairo.

SIR,

The year ending 1904 showed a very satisfactory increase in the receipt of the Light Railways Companies, although the same drawbacks were felt, namely: No Monleds held and the cattle plague.

There has been added to the lines only 27 kilometres in all and a section of 10 kilometres closed, making an actual increase of 17 kilometres for the year, giving a total of 1,107 kilometres for all three Companies as compared with 1,090 for the previous year. 15 kilometres have been opened since the close of the Companies' years by the Egyptian Delta Light Railway Co., and they are constructing several other sections.

The total receipts of the three systems amounted to L.E. 208,966 as compared with L.E. 171,067 for the previous year. It will be seen by these figures that there is an increase of L.E. thirty eight thousand and eleven (L.E. 38,011) of which sum L.E. 29,762 belong to the Egyptian Delta Light Railway Co.

The total number of passengers carried was over $5\frac{3}{4}$ millions (5,797,562), an increase over the previous year of over one million. Of this total the Delta Co. carried nearly $4\frac{1}{2}$ millions (4,478,403). Goods, 979,554 tons lifted, as against 642,969 for 1903, showing an increase of 327,585. This includes the transport of 195,195 tons of earth for reclaiming land by the Delta Co. While the kilometrage practically remains the same, the gross receipts show an increase on the total of L.E. 171,067 for 1903 equal to 22 %. To this increase more than $\frac{1}{2}$ is due to the passengers traffic, viz.: L.E. 19,113. While the cotton crop was good and contributed to the great increase over the last year, it is evident that a large factor has been the through-looking with the Government Railways. Shippers are beginning to find out that they can ship their goods to almost any part of the country while remaining themselves at home, and are availing themselves of it. It does not, however, seem to be generally known. I should like to call

attention to the fact that it is highly desirable to have this system throughout; it is not only profitable to the Light Railways, but also to the Government Railways, which receive the greater proportion of the receipts. The Light Railways Cos., whose stations number in the neighbourhood of 300, are anxious to open them all to through-booking. The Government stations number about 250. I would suggest that this matter should be taken up, and that special notices should be distributed.

Transshipping Stations.—These have in most cases been allowed the Companies when they approach the trunk lines, but the facilities allowed the Companies for passengers who wish to travel on the Light Railways are not adequate. With a large net work of Light Railways as in the Delta, it is a most difficult matter to give sufficient time between arrivals of their trains and the departures of the Government trains for the transfer of passengers, and vice versa; the margin might be sufficient if the joint stations were arranged with this in view. The Light Railways' stations should be alongside the Government stations wherever it is possible. In the rearrangement or changing position of stations this must be borne in mind. As it is, the distance between the stations varies from 1 to 2 kilometres, for example: Kafr Dawar, Damanhour, Tanta, Mehalla Kebir, Mansourah, Helia, Birket El Sab, etc. In most of these cases there is no reason why the stations should not have been alongside each other.

Extensions.—There are many extensions approved, the detailed plans of which are now awaiting sanction. Several companies of different gauges have applied for concessions to construct lines in Dakhalieh and Charkieh, a district bounded on the North by the Basse Egypt Light Railway Co., and in the West and South by the Government Railways. Nothing has been done as yet, the Government waiting until they decide what standard gauge lines they may wish to construct in this locality. An important point to consider in a case such as this is whether or not it is advisable to extend a third gauge into a country already honeycombed by two other Railways of different gauges, it being desirable to promote, as near as possible, a uniform system throughout any country served by Light Railways.

There appears to be an impression that a metre gauge can serve a country as well as a narrower gauge; this I would beg to point out cannot be so, as the cost of construction and maintenance prohibits it. One need only study the results of the two existing systems to be

convinced. The metre gauge line on the one hand has remained practically the same since its construction, while on the other hand the lines of a narrower gauge have thrown out spurs and sidings in all directions wherever there is work for them. They also do a large traffic in Sabbakh from the Koms which the metre gauge never attempts.

The great advantage of having a complete system of Light Railway lines is that it prevents monopolies and excessive charges and if the producer cannot find a suitable market in one place for his goods, he has several alternatives. That he is fully aware of this is shown by the way the traffic varies: for instance cotton grown near factories at Mansourah finds its way to the Barrage to be ginned there, and other shipments go to various distant points.

The Delta Co.'s application for 170 kilometres in Menoufieh has not yet been sanctioned. Surveys have been made, and a subway constructed at Birket El Sab for connecting the new district with the Co's system in Gharbich. The detailed plans, showing connections and trace of lines, have been submitted, but have not been sanctioned by the Government on the ground of their being too competitive. This Company has also taken over the Helwan Railway, and the receipts are already showing a very good increase. Some important lines North and East of Cairo, to the stone quarries, are being constructed, and the work is well on and should be completed by mid-summer. When these lines are working it will do away with the almost impossible system of getting the stone out by carts as at present. There will be three or four distributing dépôts on the outskirts of the town at convenient points from which the stone can be taken by carts with ease along the macadamised roads. The dépôts appear rather small but they could be enlarged later, if necessary. The same Company have under construction various other lines in Dakahlieh and Gharbich and Behera, for more fully joining up their system and opening up the country. The Basse Egypt and the Fayoum Cos., for the present, are not extending, although they have applied for various concessions.

Level Crossings.—I beg to call attention to the question of Level-crossings with the Government Railway. The last Government opinion would favour not allowing any crossings on the level. This is admittedly a sound principle, but as has already been pointed out, the area is small and closely intersected with narrow gauge Railways; it would hardly be possible to insist upon under or over crossings at every point where crossing is made. The Government Railway is asking for extensive repairs for the present crossings which; I think, are unnecessary,

providing the Light Railways Cos. have properly interlocked semaphores and dending switches. More competent men might be placed at the crossings to work the crossings equally for the State Railways and the Light Railways.

Tariffs.—The companies' Goods tariffs are now generally accepted and approved. The Fayoum Co's. tariff has recently been submitted for approval, but varies so little from the State Railways tariff that no objection could be raised except in cases, perhaps, where articles are classified too low, they will be raised to the same class as the Delta Co. The question of rates in the Fayoum Province has never been carefully studied, and the tariff should not be fixed until the matter is more carefully gone into. However, in the Fayoum Province as well as in all the other provinces where Light Railways exist, very few cases of any overcharges will be found against the companies as there are many different methods of transport. The country being so closely intersected by canals and stocked with transport animals.

Irregularities.—The chief cause of complaint against the companies has been the irregularity of trains, and it can be partly accounted for by the wet and slippery state of the Agricultural roads during the rainy season. This can hardly be avoided while the Railways follow so closely the Agricultural roads, where there is a great deal of traffic and the rails get covered with the sticky mud and retard the trains. However, a marked improvement can be noted over the previous year, chiefly due to better supervision, more powerful engines, and the increase of separate trains for goods on lines where traffic is heaviest. The separation of passengers and goods is the only satisfactory arrangement. If they are handled jointly one or the other must suffer.

Joint Stations.—Very few complaints have been made by the companies, during the last year, of delays at the transshipping stations, and in most cases the cause has been largely due to the insufficient accommodation on the transshipping platforms, which are very small in some places, and are generally so at important stations.

Equipment.—The equipment of all the companies is better than it was last year, and apparently very little shortage has been felt. The crowding of the coaching stock is sometimes unavoidable, owing to a heavy traffic from one station to the next, and should vehicles be attached sufficient to seat all passengers, they might run light after the

first stopping place. A shortage of engines is noticeable in the Fayoum Province.

Location of the Lines.—The very indifferent way that the lines have been laid by all the companies originally, must seriously be considered, and must result eventually in new surveys being made to tap more remunerative districts, and to straighten out the sharp curves. The damage to stock and to permanent way is very marked, and the sharp curves are no doubt responsible for much of it. A number of broken axles have been discovered, most fortunately when in stations. The lines now being constructed are very straight with flat curves, and the running is much improved.

Competition with Government Lines.—In some cases which have come under my notice, where it is claimed that the Light Railways compete with the Government lines, I found that goods which had been refused by the State Railway on account of the shortage of trucks, have been handed to the Light Railways for transport, for example, at Chine and Saka.

The Boat Service.—I regret that owing to the boat tax having been taken off it is impossible to give the increase in the tonnage during the last year. It appears that the only record now kept is that of the different Moudirihs registration, which records the number of boats, but not the tonnage. However, the river seems very full of boats, and many new ones are being constructed, and they are becoming more and more formidable competitors in all the provinces.

Egyptian Delta Light Railway Co.—The receipts of this company to the end of September, 1904, show the very large increase of £29,762, the net receipts being 43% better.

The working expenses show an increase over the previous year of £8,624, due to additional train mileage for both passengers and goods traffic; expenses about 56% as compared with 62% for the last year.

Expenditures and receipts.—

	1903	1904
	L.E.	L.E.
Gross receipts... ..	129,471	159,192
Working expenses	80,420	89,044
Nett receipts	49,051	70,147
Working expenses to gross receipts	62%	55.94%
Receipts per kilom. per week	3.08	3.75
Expenses	1.92	2.09

The earnings were divided as follows:—

	1903	1904	Difference
	L.E.	L.E.	L.E.
Passengers	76,937	90,966	14,029
Goods	47,233	58,224	10,991
Sundries	1,515	8,941	7,426
Telegraphs	756	1061	305
	<u>L.E.129,471</u>	<u>L.E.159,192</u>	<u>L.E.29,721</u>
Passengers carried during 1904... ..			4,478,403
" " " 1903... ..			<u>3,036,688</u>
An increase of			<u>841,715</u>
Goods traffic during 1904... ..			745,697
" " " 1903... ..			<u>471,530</u>
An increase of... ..			<u>274,167 tons</u>

Kilometrage.—The company's actual kilometrage is 840, 10 kilometres of which the company have had Government authority to stop working through a section already served by the Government Railway, viz.: the Bordein branch, the line has not been lifted, this reduces their actual running lines to 830 kilometres or 516 miles.

New lines constructed :—

Bassioun Sah-el-Hagar... ..	kil.	8
Foum-el-Sabourieh Diarb Nizam.	"	19
	<u>kil.</u>	<u>27</u>

Two other short branch lines that were opened to traffic in October after the closing of the company's year were:—

Abou Matamir Kom Troughi	kil.	7
Abu-Zabal Quarries Munsir Quarries... ..	"	8
	<u>kil.</u>	<u>15</u>

The Company have now under construction the branch line from Atfeh to Edfina, Minet-el-Gamh to Guisfa, and are about to commence work on the Saka Sidi Salem branch in Gharbich, the Kamayat Saghrat has been delayed very much, owing to obstruction of an Onmdah from the village on account of the line having to pass through an old cemetery. This is one of many causes that retard the progress of the Company.

The line of the Company in Charkieh to the quarries will no doubt be of great benefit to the villages, as they will not be dependent on Cairo or Mex Quarries.

The Company have done a lot of work during the year. They have improved greatly the alignment and running of their lines in Gharbieh and Behera. In the eastern province the lines are so badly located that the Company in many places proposes making new surveys, which work will no doubt extend over several years. Permanent station buildings of a very suitable type are being erected where traffic is established; the station sidings have generally been lengthened, and sidings have been made to the neighbouring factories. The Company's hauling power has been much improved by adding engines of a good type, repairing and generally overhauling the old ones. The Company's workshop at Tantah is inadequate, and they propose erecting large new shops to serve both Gharbieh and Menoufieh, and are now trying to get a suitable site for the buildings. On the 19th December the Helouan Railway was formally taken over by the Company. While the maintenance of the Company's lines and engines has been good, there is room for improvement in the upkeep of the coaching stock, which generally needs smartening up, especially in Behera. The Station buffets might be kept in better conditions, as they are being much used.

The Company are endeavouring to bring out season tickets for use on their lines, and it is meeting with some success. They are also experimenting on some sections with fares which have fractions of 5 milliemmes, instead of multiples of 5 milliemmes; the result has not yet been determined.

The stone traffic is now well started at Abou-Zaabd and El-Monneir quarries, and will no doubt prove very profitable to the Company.

Telegraphs.—37 kilometres of telegraphic lines have been opened during the year.

Basse Egypt Company.—This Company have not added to their kilometrage of 109; a short siding was laid at Kafr-el-Gnedid for earth for making up their banks, and another through siding made between Mit-Fares and Dekenas on the branch lines.

The Company have applied for new extensions, one from Melallet Ingag to Fariscour, and from a station on the newly proposed line Mit-Kholi to the main line at Mit-Kholi Moumen, and south from Mit-Fares to Simbellawein and Abou-el-Chekuk. No decision has been given until the Government decide whether or not to construct new lines in this territory.

Receipts and Expenditures.—

	1903 L.E.	1904 L.E.
Gross receipts	23,091	26,199
Working expenses	11,381	11,583
Nett receipts	11,710	14,616
Working expenses to gross receipts... ..	47%	44%
Receipts per kilom. per week	4.07	4.62
Expenses	2	2.04
Passengers carried during 1904... ..	793,733	
.. .. 1903... ..	668,344	
Showing an increase of	<u>125,389</u>	
Goods traffic during 1904	56,274 tons	
.. .. 1903	54,642 ..	
Showing an increase of	<u>1,632 tons</u>	

The Company is well equipped, the only point we might criticise is that it shows a certain lack of enterprise; it would serve the country very much better, and help to develop it, if it would run sidings into the koms, and thus distribute a fertiliser that is so generally needed. The stock is well maintained, but the permanent way requires more supervision.

The run between Mansourah and Matarieh has been reduced half an hour, which is an improvement; but there is no reason that it should not be reduced a full hour which would then make the run to Matarieh in 3 hours. This Company is interesting itself in a new line of steamers across Lake Manzaleh from Matarieh to Port-Saïd, which will give a connection between Mansourah and Port-Saïd in 5½ hours; it is expected that this will improve both passenger and goods traffic.

While the running is very good on the main line, the location of the branch line is very bad, and curves should be flattened.

Fayoum Light Railway Co.—The Fayoum Company have not made any new extensions during the year. In spite of the unsatisfactory state of the control, the Company's receipts show an increase over the previous year of over L.E. 5,000. This is rather a remarkable showing, and we trust it is not due to any negligence of maintenance. Certainly there is a marked scarcity of permanent way materials for renewals, sidings, and maintenance of stock, which must be largely added to shortly. The stock is fairly well maintained, but owing to the shortage in engines they are overworked, and there is no time for proper repairs. Several axles of the engines have been broken during the last

12 months, which I think can be accounted for either by reckless driving around sharp curves, or owing to the 5' 6" wheel base being too long. These sharp curves should be eliminated without delay, but it is with difficulty that the smallest improvements can be carried out for the above reason—scarcity of permanent way materials. The entire system requires more money spent on it.

There has been lack of attention shown by the staff in the interests of the system, and under these conditions, one does not expect, nor does one find, a spirit of enterprise. The staff appears to be entirely out of hand.

Owing to the prosperity of the Province, the receipts of the Company show an increase over the previous year amounting to L.E.5,105.

The nett receipts are L.E. 11,222.

The working expenses are L.E. 946 less than the last year.

Expenses are 52% as compared with 72% of the previous year.

Receipts and Expenditures.—

	1903	1904
	L.E.	L.E.
Gross receipts	18,423	23,528
Working expenses.. ...	13,251	12,305
Nett receipts	5,173	11,223
Working expenses to gross receipts...	72%	52%
Annual gross receipts per kilom.	109	140
Annual working expenses per kilom.	78	73
Annual nett receipts per kilom.	30	66
Ratio of goods receipts to coaching	88%	91%
Passengers carried during 1904... ..	525,426	
" " " 1903... ..	478,853	
An increase of	<u>46,573</u>	
Goods traffic during 1904	168,583 tons	
" " " 1903	146,797 "	
An increase of	<u>51,786 tons</u>	

The maintenance of permanent way has been fairly good. The traffic and Locomotive Departments have apparently been left to run themselves, and the service has not in consequence been good.

It may be of interest to give the following comparisons:—

The total number of passengers carried by the E.R.A.									
during 1904 amounted to...	...	...	...	...	...	...	...	...	17,721,922
with a total kilometrage of	...	...	...	...	...	...	...	...	2,334
The Egyptian Light Railway Co. carried...									
with a total kilometrage of	...	...	...	...	...	...	...	...	4,478,403
	...	...	...	...	...	...	...	...	842

It will be seen by this that the State Railways									
carry	...	...	...	...	...	...	...	...	7,594 passengers per kilom.
the Delta Light Co.	...	...	...	...	...	...	...	...	5,513 " " "

A fair comparison of receipts and average sums paid per ticket for the passengers traffic is hard to make, as the Government Railways have 1st, 2nd and 3rd class tickets, while the Delta has only 1st and 3rd.

They are however as below:—

								Receipts from passengers 1901	Average sum per Ticket mill.
E.R.A.	...	...	...	...	...	...	...	1,074,563	61
Delta Co.	...	...	...	...	...	...	...	90,966	20

Tables showing coaching and goods receipts, and details of permanent way, will be found in table No. 1, 2, 3 attached herewith.

I have the honour to be,

Sir,

Your obedient servant,

J. ALEXANDER GUNN.

Inspector and Secretary, Light Railway Commission

AGRICULTURAL RAILWAYS.

Annual Report, 1904.

DETAILS OF COACHING RECEIPTS.

Table No. I.

Number.	TITLE OF LINE.	Average length of line opened to traffic during 1904.	NUMBER OF PASSENGERS CARRIED.					RECEIPTS.		Year to which figures given refer.
			First Class.	Second Class.	Third Class.	Total.	Passengers per kilometre of line opened.	Average sum paid for each ticket.	Total amount received.	
		Kilometres. Miles.								
1	Egyptian Delta Light Railway Company ...	$\left\{ \begin{array}{l} \text{K.} \\ 812 \text{ or} \\ \text{M.} \\ 507\frac{1}{2} \end{array} \right\}$	$\left\{ \begin{array}{l} 1,39,452 \\ \end{array} \right\}$	—	4,238,951	4,478,403	5,515	23.14	90,906	(Aug. 1903 to (Sept. 1904.
2	Mansourah-Matarieh ...	$\left\{ \begin{array}{l} \text{K.} \\ 109 \text{ or} \\ \text{M.} \\ 68\frac{1}{2} \end{array} \right\}$	$\left\{ \begin{array}{l} \text{Classes not separated.} \\ \end{array} \right\}$			793,733	7,984	22.6	18,002	(July 1903 to (June 1904.
3	Fayoum Agricultural Light Railway Company	$\left\{ \begin{array}{l} \text{K.} \\ 108 \text{ or} \\ \text{M.} \\ 105 \end{array} \right\}$	$\left\{ \begin{array}{l} 15,561 \\ \end{array} \right\}$	—	509,865	525,426	3,127	23.14	42,458	(Jan. 1904 to (Dec. 1904.

AGRICULTURAL RAILWAYS.

Table No. II.

DETAILS OF PERMANENT WAY.

Annual Report, 1904.

Number.	Title of Line.	Provinces	Term of concession	Date of concession	Approximate length of line included in concession	Change of line.	Weight of mile.	Length of line opened December 1903.	Length of line opened during 1904.	Total length of line December 1904.	Lives under construction.
			Years.		Kiloms. Miles.	Metros. Ft. ins.	Kilop. lbs. yd.	Kiloms. Miles.	Kiloms. Miles.	Kiloms. Miles.	Kiloms. Miles.
1	Egyptian Delta Light Railway Company ...	Bedouin { Gharbiéh { Charkieh { Dakahlieh { Kalioubieh	70	March, May, 1896	K. 514 321 M.	M. 0.75 2 5/8	15 or 32 18 or 39	K. 813 or 508	K. 17 or mils. 10 1/2	K. 830 or mils. 518 1/2	{ 53
2	Mansourah-Matarieh and Branch ...	{ Dakahlieh ...	50	June, 1895	K. 100 M. 62	M. 1.00 3 3/4	23 or 50 lbs.	109 or 68	{ Nil. {	K. 109 or mils. 68	{ None.
3	Fayoum Agricultural Light Railway Company ...	{ Fayoum ...	70	May, 1897	{ K. 146 or M. 91	M. 0.75 or 2 5/8	15 or 32	168 or 105	{ Nil. {	K. 168 or 105	{ None.
		Total number of kilometres ...			760	—	—	1,090	17	1,107	—
		Total number of miles ...			474	—	—	681	10 1/2	691 1/2	—

AGRICULTURAL RAILWAYS.

Annual Report, 1904.

GOODS AND COACHING RECEIPTS.

Table No. III.

Number.	TITLE OF LINE.	Average length of line open to traffic during 1904.	Goods carried.	Receipts from goods.	Receipts from coaching.	Total gross receipts including every thing.	Gross receipts per kilom. of line including every thing.	Total expenditure.	Annual working expenses per kilom. of line.	Annual net receipts per kilom. of line.	Ratio of working expenses to gross receipts.	Ratio of goods receipts to coaching receipts.
		Kilom. Miles.	Tons.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	L.E.	%	
1	Egyptian Delta Light Railway Company ...	{ K. 507 } or { M. 812 }	{ 745,697 }	58,224	90,966	159,192	196	89,044	102.—	87.—	59.94	1 to 1.56
2	Mansourah-Matarieh	{ K. 109 } or { M. 68 }	{ 56,274 }	8,274	18,002	26,276	241	11,583	106.—	134.—	44.—	1 to 2.7
3	Fayoum Agricultural Light Railways ...	{ K. 168 } or { M. 105 }	{ 168,583 }	11,672	11,855	23,526	140	12,305	78.—	66.—	52.—	1 to 1.01

REPORT
ON THE
GIZA ZOOLOGICAL GARDEN

For 1904

BY
STANLEY S. FLOWER.

DIRECTOR.

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FRONTISPIECE.—Photograph of *Orycteropus aethiopicus*, Ant-Bear from Kordofan, presented by Col. H.W. Jackson, C.B., 1st, October 1904.

REPORT ON THE GIZA ZOOLOGICAL GARDENS FOR 1904.

I. STAFF.

<i>Director</i>	CAPTAIN S. S. FLOWER.
<i>Clerk</i>	KAMEL FAHMI EFFENDI.
<i>Storekeeper</i>	SALEH LEBIB EFFENDI.
<i>Gatekeeper</i>	MUSTAFA EL ANTABI EFFENDI.
"	ISMAIL SOLIMON.
<i>Head Keeper</i>	BAKR AHMED.
<i>Head Carpenter</i>	MOHAMMED EL BEHAIRI.
<i>Head Gardener</i>	IBRAHIM EL HAMZAWI.

Two Police-Constables.	Two Propagators.
Six Keepers (1st and 2nd class).	Seven Flower-men.
Eighteen Keepers (3rd and 4th class).	Two Mowers.
Four Night-watchmen.	One Rock-gardener.
Two Artizans.	Ten Waterers.
Three Mosaic-pavement repairers.	Ten Path-sweepers.
Two Leading Gardeners.	Four Garden-labourers.
One Tree-cutter.	One Carter.
In all, eighty-three men on monthly pay.	
And a varying number of labourers on daily pay.	

II. VISITORS AND GATE RECEIPTS.

(i) The number of visitors and amount of gate-money as compared with previous years is shown in the following table :—

YEAR.	VISITORS.	£E.	Mill.
1899	43,567	991	950
1900	44,296	976	130
1901	50,711	1,114	840
1902	47,117	1,037	120
1903	55,937	1,213	420
1904	61,711	1,388	150

N.B.—One Egyptian Pound (£E. 1) equals £1. 0s. 6½d. or 25 francs and 92 centimes.

(ii) Visitors, 1904.

	Cham-el-Nesem		Sunday afternoon	Week days (and fairs) mornings	Soldiers and children	Schools (if admitted free)	TOTAL	GATE-MONEY	
	Paying P.T. 10	Paying P.T. 5	Paying P.T. 1	Paying P.T. 1	Paying P.T. 1			£E.	Mill.
January.. ...	—	—	1,105	3,433	912	223	5,673	133	020
February ...	—	—	1,510	5,872	1,869	274	9,525	211	630
March	—	—	1,106	4,088	997	129	6,320	147	030
April	301	77	836	3,517	1,163	102	5,996	157	720
May	—	—	563	2,719	910	533	3,755	91	930
June	—	—	287	2,046	576	199	3,108	61	030
July	—	—	195	2,549	572	147	3,463	66	450
August... ..	—	—	145	2,035	561	68	2,809	53	560
September ...	—	—	143	2,335	581	182	3,244	59	690
October... ..	—	—	548	3,553	931	213	5,245	107	770
November ...	—	—	753	2,806	910	249	4,718	102	870
December ...	—	—	1,005	5,901	2,711	235	9,855	195	440
TOTAL...	301	77	8,196	40,857	12,726	2,554	61,711	1,388	150

III. LIST OF DONORS, AND THEIR DONATIONS DURING 1904.

H.H. THE KHEBIVE.

- 1 Giraffe, *Giraffa camelopardalis* 5th Sept.
deposited in Gardens since 21st June 1902.

AMIN EFFENDI FAHD MALOUF, Mulazim Awal, Medical Corps, E.A.

- 1 Chita, *Cynalurus jubatus* 1st Oct.
1 Hyrax, *Procavia* sp. incert. 1st Oct.

ATKINSON, MR. J. A., c/o T. Cook and Son, Cairo.

- 1 Gazelle, *Gazella isabella* 5th March.

AZOOS MOHAMMED, Sharia Ab-el-Aziz, Cairo.

- 1 Tortoise, *Testudo leithi* 12th July.

BAYUMI ABU TALAB, Giza.

- 1 Southern Little Owl, *Athene glaucus* 1st June.

BEADNELL, MR. H. J. L., Survey Department.

- 1 Leader's Gazelle, *Gazella leptoceros* 16th April.

BORTON BEY, Kaimakam N. T., E. A., (Captain, 6th Royal Warwickshire Regiment).

- 1 Leopard, *Felis pardus* 1st Oct.
1 Elian's Wari Hog, *Phacochoerus africanus* 1st Oct.
1 Tortoise, *Testudo pardalis* 1st Oct.

BUTLER, MR. A. L., Game Preservation Department, Khartoum.

- 12 Ultramarine Finches, *Munia ultramarina* 1st Oct.

BUTLER BEY, Kaimakam J. H., E. A.

- 2 Sabre-horned Antelopes, *Oryx leucoryx* 1st Oct.

CARTER, MR. HOWARD, Inspector of Antiquities, Cairo.

- 1 Monkey, *Macacus fascicularis* 23rd Nov.

CLIFTON, MR. COURTENAY, Tanzim Service, P. W. D.

- 1 Fox, *Canis vulpes* 29th April

COCHRANE, MR. JAMES H.

- 1 Green Spotted Cuckoo, *Coccyzus glaucarius* 16th March.

CRISPIN, BIMEASHI E. S., E. A.

- 1 Sand Fox, *Canis famelicus* 16th Feb.

DAVEY, THE HON. MRS. A. J., Gezira, Cairo.

- 1 Gazelle, *Gazella dorcas*... .. 8th March.

FLOWER, MRS. S. S., Giza.

1 Weaver Bird, <i>Placens quela</i>	20th Jan.
1 Andrews' Squirrel, <i>Sciurus andersoni</i>	27th April.
1 Hedgehog, <i>Echinocentrus auritus</i>	24th May.
1 Nutmeg Bird, <i>Munia punctulata</i> ,... ..	30th May.
1 Hawfinch, <i>Coccothraustes vulpatrix</i>	16th Dec.

FLOWER, CAPT. S. S., Giza.

1 Bat, <i>Myotis aegyptiacus</i>	21st April.
1 Bat, <i>Rhinolophus euryale</i>	21st April.
2 Bats, <i>Taphozous nudiventris</i>	19th May.
1 Bat, <i>Myotis thersites</i>	25th May.
1 Gerbille, <i>Gerbillus shawi</i>	4th June.
2 Lizards, <i>Acanthopneuste pallida</i>	4th June.
1 Bat, <i>Pipistrellus neopelti</i>	11th Aug.

GRAVES, MR. PHILIP P., Cairo.

1 Greater Jerboa, <i>Dipus gerbois</i>	10th Jan.
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HALLAM, MR. H. Sudan Civil Service.

1 Lioness, <i>Felis leo</i>	16th Feb.
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HASTOWER, MR., Grand Hotel, Khartoum.

6 African Silver-bill Finches, <i>Munia cantans</i> ...	1st Oct.
2 Red-backed Sparrows, <i>Passer rufidorsalis</i> ...	1st Oct.
1 Blue-naped Ooly, <i>Colinus macrurus</i>	1st Oct.

HASSAN GAAD, Giza.

1 Kestrel, <i>Falco tinnunculus</i>	16th June.
1 Weasel, <i>Mustela africana</i>	27th June.

INNES BEY, DR. F. WALTER, M.B.O.U.

1 Fat-tailed Gerbille, <i>Pachyaromys dupressi</i> ...	7th May.
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JACKSON BEY, Kaimakan E.S., E.A. (Captain, Welch Regiment).

1 Jungle Cat, <i>Felis chaus</i>	1st April.
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JACKSON PASHA, C.B., H. E. Lewa, H. W., E.A., Governor of Dongola.

1 Ant-Bear, <i>Orycteropus aethiopicus</i>	1st Oct.
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JOHNSTONE, MRS. J. H. L'ESTRANGE, Kasr-el-Dubara, Cairo.

1 Monkey, <i>Cercopithecus aethiops</i>	16th Nov.
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MACHELL, MR. P. W., Ministry of the Interior, Cairo.

1 White Stork, <i>Ciconia alba</i>	22nd June.
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MACNAGHTEN, Bimbashi the Hon. M. P., E. A., (Captain, 21st Royal Scots Fusiliers).

1 Lion, <i>Felis leo</i>	1st Oct.
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MACLAUGHLIN, The Rev. Dr. H. T., American Mission, Sobat.

1 Sacred Ibis, <i>Ibis aethiops</i>	1st Oct.
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Mc HUGH, MR. M., Inspector, S. P. C. A., Cairo.

1 Waterhen, <i>Gallinula chloropus</i>	18th Oct.
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MIDDLETON, MR. G. B., Sudan Government Steamers.

2 Wild Pigs, <i>Sus scottianensis</i> ?	1st Oct.
1 Grey Eagle-Owl, <i>Bubo cinerascens</i>	1st Oct.
1 Francolin, <i>Francolinus clappertoni</i>	1st Oct.

- MINOT, MONSIEUR FERNAND, Secretary, Cairo Tramway Company.
2 Lesser Jerboas, *Dipus jaculus* 28th July.
- MOHAMMED BEKIR BEY, Miralai, E.A.
2 Egyptian MongOOSE, *Herpestes ichneumon*... .. 29th July.
- MOHAMMED CHERIF BEY, Kasr-el-Dubara, Cairo.
1 Caracal Lynx, *Felis caracal*... .. 5th April.
- MOHARREM BEY ABU GABEL.
1 Egyptian MongOOSE, *Herpestes ichneumon*... .. 23rd May.
- MOORE, MR. C.H., Birksey, Zeitoun.
1 Fox, *Canis vulpes* 2nd May.
- NEWCOMBE, Bimbashi S.F., E.A., (Lieutenant, Royal Engineers).
2 Egyptian Geese, *Chenulopez aegyptiacus* 1st Oct.
- NOUH-EL-DIN SABHI EFFENDI, Cairo.
1 Monkey, *Macacus fascicularis* 20th July.
- NUBAR, MILE, c/o BOGHOS PASHA NUBAR, Cairo.
1 Fox, *Canis vulpes* 24th May.
- O'CONNELL BEY, Miralai J.R., E.A., (Major, Shropshire Light Infantry), Governor of Korlofan.
1 Giraffe, *Giraffa camelopardalis* 16th Feb.
1 Kudu, *Strepsiceros kudu* 16th Feb.
1 Jackson's Hartebeest, *Bubalis leuei* 1st Oct.
- PERCIVAL, MR. W.H., Sudan Government Agricultural and Lands Department.
1 Abdim Bey's Stork, *Ciconia abdimii* 1st Oct.
- PINE-COFFIN, Major J.E., D.S.O., Loyal North Lancashire Regiment, and Commandant, Mounted Infantry, Abassia.
1 Striped Hyena, *Hyena striata* 26th Feb.
- PLAYFAIR, Capt. N.E., late 25th K.O.S.B.
1 Kudu, *Strepsiceros kudu* 7th Jan.
- RIZZOLI, MME. ANTOINETTE, Cairo.
1 Monkey, *Cercopithecus aethiops* 25th June.
- SARGENT, Lieutenant A., Army Ordnance Department.
1 Monkey, *Cercopithecus aethiops* 7th Dec.
- SCHUELLER, HERR C.H., Alexandria.
3 Fish, *Barbus molepus* 16th June.
9 Fish, *Haplochromis schuelleri* 16th June.
16 Fish, *Paratilapia multicolor*... .. 16th June.
- TARREL, MR. JOHN A., Director of Customs, Port Said.
2 Slender Lorises, *Loris gracilis* 4th Nov.
- VENTURA, SIGNOR FRANCESCO, Cairo.
2 White Rat, *Mus norvegicus* var 22nd Oct.
- WEBER, DR. FRANZ, Vienna University.
1 Terrapin, *Chelonnys caspica* 11th Nov.
4 Tortoises, *Testudo graeca* 11th Nov.
1 Tortoise, *Testudo graeca*... .. 16th Nov.
3 Snakes, *Coluber leopardinus*... .. 16th Nov.
1 Sand-Boa, *Eryx jahnii* 22nd Nov.

WILKINSON, MR. A.N., Repression of Slave Trade Department,
Khartoum.

1 Wild Donkey, *Equus africanus* 16th Feb.

WILLIAMSON, MR. H., Wardan Estate Company, Egypt.

1 Desert Wurm-Lizard, *Varanus priscus*, 15th May.

WILSON, DR. W.H., Cairo.

1 Fennec Fox, *Canis zerda* 27th June.

WINGATE PASHA, H.E. FERIK SIR F. REGINALD, K.C.B., K.C.M.G.,
D.S.O., Sirdar, E. A. and Governor-General of the Sudan.

1 Chimpanzee, *Anthropopithecus troglodytes*... .. 1st Oct.

10 Cape doves, *Oena capensis* 1st Oct.

Besides the above donations of live animals the Gardens were also presented with a pair of very artistically sculptured Lions in white marble by the Director-General of Antiquities, and with a plant of the White Arum Lilly, *Calla* sp. *incert*, by Herr Christian Stamm, 23rd March.

Thanks are also due to the following foreign Institutions for presenting copies of the under-mentioned publications received during 1904:—

Africa.

1. Cape Town.—South African Museum.

W. L. SCLATER, M.A., F.Z.S., Director. (Report for 1903).

America.

2. New York.—New York Zoological Society.

W.T. HORSADAY, C.M.Z.S., Director. (Seventh and Eighth Annual Report 1902 and 1903, and Bulletins, Nos 12, 13, 14 & 15).

3. Philadelphia.—Zoological Society of Philadelphia.

ARTHUR ERWIN BROWN, C.M.Z.S., Secretary. (Thirty-second Annual Report, 1903-4).

4. Washington.—Smithsonian Institution.

S.P. LANGLEY, Secretary. (Proceedings, U. S. National Museum, Vols. 23, 24, 25 and 26. Bulletins, U. S. National Museum No. 50 [Parts I and II], 51 and 52. Also thirty-three separate papers).

Asia.

5. Buitenzorg.—Institut Botanique de l'Etat, Buitenzorg, Java.
(Bulletins No. 18 et 19).

6. Colombo.—Colombo Museum, Ceylon.

Dr. A. WILLEY, M.A., D.Sc., F.Z.S., Director. (Spolia Zeylonica, Vol. I., Part 4, and Vol. II, Parts 5, 6 and 7).

Asia—continued.

7. Kuching.—Sarawak Museum, Borneo.
R. SHELDFORD, M.A., F.L.S., C.M.Z.S., Curator. (Report for 1903).
8. Singapore.—Raffles Museum and Library.
Dr. R. HANITCH, Ph. D., Curator. (Report for 1903).
9. Taiping.—Perak Museum.
L. WRAY, F.Z.S., Curator. (Report for 1903).
10. Trivandrum.—Government Museum and Garden, Travancore.
H. S. FERGUSON, F.L.S., F.Z.S., Director. (Report for M.E. 1078, 1902-1903).

Australia.

11. Melbourne.—Zoological and Acclimatisation Society of Victoria.
W.H.D. LE SOUËF, C.M.Z.S., Director, (Fortieth Annual Report, 1903).

Europe.

12. Amsterdam.—Koninklijk Zoologisch Genootschap "Natura Artis Magistra."
Dr. C. KERBERT, C.M.Z.S., Director. (Two illustrated Guidebooks).
13. Bâle.—Zoologischer Garten in Basel.
Dr. GOTTFRIED HAUMANN, Direktor. (Jahresbericht, 1903).
14. Dublin.—Royal Zoological Society of Ireland.
Dr. R. F. SCHARFF, Ph.D., B.Sc., F.Z.S., Secretary. (Seventy-second Annual Report, 1903).
15. Copenhagen.—Zoologiske Have ved Kjøbenhavn.
J. SCHIOTT, Direktor ("Vilde Dyr som patienter" Frem, No 21.)
16. Hague.—Koninklyk Zoölogisch Botanisch Genootschap.
D. N. DIETZ, Directeur. (Album of twelve photographs and Verslag over het jaar, 1903).
17. Hamburg.—Zoologischen Gesellschaft in Hamburg.
Dr. HEINRICH BOLAR, C.M.Z.S., Direktor. (Forty-second Annual Report, 1903).
18. Hannover.—Zoologischer Garten.
Dr. ERNST SCHÄFF, Direktor. (Report, 1903-1904).
19. Leipzig.—Zoologischer Garten.
E. PINKERT, Direktor. (Report for 1902 and 1903).
20. London.—British Museum of Natural History.
Prof. E. R. LANKESTER, M.A., LL.D., F.R.S., F.Z.S. Director. (Guide to Fossil Mammals and Birds, eighth edition).

IV. BUILDINGS.

1. North Gate:—turnstiles, railings and gate-house repainted, space between outer gate and turnstiles repaved where necessary, and path just within turnstiles relaid and sanded.

2. Hyæna House completely overhauled, painted and repaired.

3. The building of a new Band Stand commenced.

4. Four divisions of the western, and one of the Central, Paddocks repainted.

5. New cages for Birds of Prey, Alligators, and Oribi, commenced in 1903, finished.

6. The old Monkey House was demolished, and the site laid out as garden, the very fine old marble pavement being retained and repaired; but in spite of careful restoration it is feared it cannot last many years. To accommodate the collection of monkeys and lemurs a series of temporary cages were made and placed in the Selamluk Garden, near the Bear House.

7. Selamluk Paddocks:—a new house was built for the Nuer Ox and Addax, and temporary yards were added for the new Giraffe and Zebras.

8. The Kiosk in the south-east corner of the Haremluk Garden, built in the reign of H. H. the Khedive Ismael, was found to be unsafe, owing to the walls bulging outwards, and was consequently demolished, restoration being impracticable.

9. Among smaller works may be mentioned: Repairs:—to the cement walls and bottom of the Citadel Pond, the south face of the Citadel Grotto the Porcupines cages, and to the north wing of the old Caracol, so as to eventually use it as a workshop. Repainting five of the small carnivora cages, and providing two cupboards in the Lion House. Providing six new seats and a cupboard in the Tropical House. Repairing and mounting, near the south-gate, the two White Marble Lions, presented by the Antiquities Department. Repainting Monkey cage by South Gate. Stopping some new leaks in the African Aviary tanks. Fitting up a small Museum with four small wall cases, in the old lodge in the north-east corner of the Selamluk Garden. Making a temporary cage for the new Caracol Lynx. Repainting "Rotunda," and demolishing remaining row of old Birds of Prey cages.

10. Paths.—Harendik, repairs continued. Selandik, south side of Lion House raised, relevelled and sanded.

11. Nineteen new garden seats made, and four old ones repaired and repainted.

12. Labels. Zoological, new	47
" repainted	16
" written, etc....	46
Botanical, new	7

Besides the above, the following work was carried out by contract, at the expense of the Towns and State Buildings Department :—

1. Repainting the interior and exterior euges, doors, windows, and sky-lights of the Lion House, and providing eight new Turkish oak sleeping benches for the animals.

2. Adding a bathroom, wash-house, etc., to the Director's House.

3. Building near the north-gate, lavatories, etc., for ladies and men.

4. Repainting outer iron gates at North Gate.

V. ANIMALS.

(1). Number of Animals alive in Gardens.

	6th Oct., 1898		6th Oct., 1899		6th Oct., 1900		6th Oct., 1901		6th Oct., 1902		6th Oct., 1903		6th Oct., 1904	
	Specimens.	Species.	Specimens.	Species.	Specimens.	Species.	Specimens.	Species.	Specimens.	Species.	Specimens.	Species.	Specimens.	Species.
<i>Mammals.</i>														
Primates... ..	59	15	66	15	80	19	66	19	69	17	73	15	78	15
Carnivora... ..	25	12	39	13	67	20	46	17	66	22	57	20	49	20
Insectivora... ..	—	—	—	1	2	1	3	1	10	1	4	2	5	3
Chiroptera... ..	—	—	2	1	2	1	2	2	12	2	16	3	6	2
Edentata... ..	—	—	4	4	16	7	6	4	25	7	21	8	29	13
Ungulata... ..	46	17	50	14	82	20	81	18	100	25	115	24	119	31
Edentata... ..	1	1	1	1	1	1	1	1	1	1	1	1	2	2
Marsupialia... ..	5	5	2	2	9	6	6	4	4	3	4	3	4	3
TOTAL MAMMALS.	126	50	172	51	253	75	211	66	287	78	291	76	292	93
<i>Birds.</i>														
Passeres... ..	7	1	55	7	51	7	64	15	79	29	123	24	210	36
Picaria... ..	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Psittaci... ..	10	6	30	11	53	17	49	20	74	21	92	28	77	21
Striges... ..	—	—	—	—	—	—	5	1	4	1	3	1	3	2
Accipitres... ..	16	7	18	8	26	9	45	11	18	16	33	14	28	13
Stercorariidae... ..	1	4	24	2	15	2	17	2	15	2	15	8	14	3
Hirundinidae... ..	1	1	5	3	6	3	6	3	21	7	30	8	35	11
Anseres... ..	24	8	40	11	60	11	61	16	63	13	43	10	36	11
Columbae... ..	30	8	30	7	50	7	45	6	60	8	81	7	53	10
Pterocletes... ..	1	1	6	2	7	2	23	1	21	1	15	1	14	1
Gallinae... ..	38	11	49	11	87	16	125	11	117	11	89	10	74	10
Fulicariae... ..	—	—	—	—	—	—	1	1	1	1	2	2	11	3
Alcedinidae... ..	—	—	1	1	4	2	12	2	10	3	11	3	7	3
Limcolae... ..	—	—	—	—	—	—	—	3	3	2	4	2	5	2
Gaviidae... ..	—	—	3	1	3	1	3	1	3	1	4	1	4	1
Cathartidae... ..	2	1	2	1	2	1	2	1	—	—	—	—	—	—
Struthionidae... ..	3	2	5	1	7	1	8	2	7	2	7	2	6	2
TOTAL BIRDS.	133	47	268	66	371	76	495	93	525	112	552	116	575	133
<i>Reptiles.</i>														
Chelonia... ..	1	1	13	7	24	8	58	10	63	10	73	18	59	16
Crocodylia... ..	—	—	2	1	2	1	2	1	3	2	2	1	2	1
Squamata... ..	—	—	16	6	15	8	33	9	14	9	11	11	42	16
TOTAL REPTILES.	1	1	31	14	41	17	93	20	110	21	116	30	103	33
Batrachians... ..	—	—	2	1	5	1	—	—	—	—	—	—	2	1
GRAND TOTAL.	270	98	473	132	670	169	770	179	923	211	959	222	972	260

(2). To the list of seventy-one species of birds observed wild in the Gardens, given in the Report for 1903, pp. 16 and 17, can now be added:—

1. Blue Thrush, *Monticola cyanus*.
2. Spotted Flycatcher, *Muscicapa grisola*.
3. White-collared Flycatcher, *Muscicapa collaris*.
4. Hawfinch, *Coccothraustes vulgaris*.
5. Swift, *Cypselus apus*.
6. European Nightjar, *Caprimulgus europæus*

and the following are also believed to have occurred :—

1. Lesser Whitethroat, *Sylvia curruca*
2. Wood Warbler, *Phylloscopus sibilatrix*.
3. Fantail Warbler, *Cisticola curreitana*.
4. House-Martin, *Chelidon urbica*.
5. Scops Owl, *Scops gin*.
6. Griffon Vulture, *Gyps fulvus*.
7. Great White Egret, *Ardea alba*.
8. Pratincole, *Glareola pratincola*.

Snakes caught in the Gardens during the last six years :—

	1899	1900	1901	1902	1903	1904
<i>Glaconia cauri</i>	2	—	3	—	13	1
<i>Eryx jaculus</i>	1	—	—	1	—	—
<i>Zamenis florulentus</i>	—	1	—	2	2	6
<i>Psammodphis sibilans</i>	—	—	—	—	1	1
<i>Turdophis olivatus</i>	1	—	—	1	3	1
<i>Naja haje</i>	—	—	3	—	—	1

One very small Scorpion was caught during the year ; this is only the second scorpion that has been seen in the Gardens during the last six years, though very careful search has been made for them.

(3). Registered additions to the Menagerie :—

	1899	1900	1901	1902	1903	1904
Acquired by presentation	98	103	74	103	48	108
“ “ purchase	515	209	343	126	309	259
“ “ exchange	5	17	5	6	10	6
“ “ deposit	26	11	27	39	13	24
Bred in the gardens	27	31	25	64	81	81
Total... ..	671	371	474	338	461	478

Of the additions during 1901 the following should be specially mentioned:—

- The Kudu, presented by Capt. N.E. Playfair, 7th January.
- The Giraffe, Kudu and Hartbeest presented by Major J.R. O'Connell, 16th February and 1st October.
- The Wild Donkey, presented by Mr. A. N. Wilkinson, 16th February.
- The Caracal, caught in Old Cairo, presented by Mohamed Cherif Bey, 5th April.
- The Sacred Shrew, caught in the Giza Gardens by the Director, 25th July.
- The Chimpanzee, presented by Gen. Sir Reginald Wingate, K.C.B. etc., 1st October.
- The Hyrax, presented by Amin Eff. Fahd Malouf, 1st October.
- The Sabre-horned Antelopes, presented by Mr. J. H. Butler, 1st October.
- The Wurt Hog, presented by Capt. N.T. Borton, 1st October.
- The Ant-Bear, presented by Col. H.W. Jackson, C.B., 1st October.
- The Coly, presented by Mr. Hantower, 1st October.
- The Eagle-Owl, presented by Mr. G.B. Middleton, 1st October.
- The Sacred Ibis, presented by the Rev. Dr. MacLaughlan, 1st October.
- The pair of Zebras, purchased 4th November

(4). The following were bred in the gardens during 1901:—

- Six Egyptian Jackals, *Canis lupaster*.
- Two Cairo Spiny Mice, *Acomys cahirinus*.
- Ten Dorcas Gazelles, *Gazella dorcas*.
- One Arabian Gazelle, *Gazella arabica*.
- Two Ariel, *Gazella soemmerringi*.
- One Angora Goat, *Capra hircus* var.
- One Circassian Goat, *Capra hircus* var.
- Twelve Ibex, *Capra nubiana*.
- One Sudan Sheep, *Ovis aries* var.
- Seven Hedjaz Sheep, *Ovis aries* var.
- One Arni Wild Sheep, *Ovis lernia*.
- One Sabre-horned Antelope, *Oryx leucoryx*.
- Five Canaries, *Serinus canarius*.
- Two Cockateel *Calopsittacus nova-hollandiae*.
- Several Buff-backed Herons, *Ardea ibis*.
- Three Mute Swans, *Cygnus olor*.
- Ten Barbary Turtle-Doves, *Turtur risoria*.
- Five Central African Doves, *Turtur decipiens*.

Five Palm Doves, *Turtur senegalensis*.
 Five Barred Doves, *Geopelia striata*.
 One Silver Pheasant, *Euplocamus erythemerus*.
 Two Peafowl, *Pavo cristatus*.

(5). Registered departures from the Menagerie:—

	1899	1900	1901	1902	1903	1904
Removed for various causes...	10	23	27	88	60	131
Disappeared (mostly small birds)	27	21	6	33	23	21
Killed by wild foxes, cats, rats, etc	21	21	20	6	—	37 *
Accidental deaths from animals injuring themselves, or each other	16	10	19	16	20	19
Deaths from natural causes ...	233	194	210	196	235	267
Total ...	310	269	282	339	338	481

* Including 19 newly arrived Weaver Birds killed on the night of the 8th December by, it is believed, a Desert Hare.

Of the departures during 1904 the following should be specially mentioned:—

The Giraffe "Lady" presented by Lord Kitchener of Khartoum, a.c.b., 29th May 1900, which died of ulcerative gastritis on the 1st Jan.
 The Ant-Bear, presented by Col. H. W. Jackson, c.n., 1st October 1901, which died from heart disease on the 8th October.
 And the two Indian Elephants, acquired respectively 10th January, 1898, and 11th January, 1899, which were disposed of and sent to Europe.

The number of deaths in each month was:—

	1899	1900	1901	1902	1903	1904
January	33	15	19	26	25	31
February	22	15	18	14	17	19
March	11	15	11	18	8	18
April	17	12	11	11	15	12
May	19	19	12	8	15	17
June	14	18	13	12	18	25
July	16	11	11	14	11	19
August	11	5	18	13	20	19
September	14	11	21	12	21	19
October	30	17	17	18	21	21
November	31	19	23	20	17	33
December	15	34	26	30	41	34
Total	233	194	210	196	235	267

Of these 267 animals there were :—

29	monkeys.
12	lemurs (6 of which were of one species <i>Loris gracilis</i>).
15	carnivora.
8	bats.
5	insectivora.
11	rodents.
29	ungulates.
1	edentate.
<hr/>	
110	total mammals.
127	birds.
30	reptiles.

Forty-nine of the above died within one month of arriving in the Gardens, and twenty between one and two months of their arrival.

(6). To the list of the species and varieties of animals which have been exhibited alive in these Gardens, given in the Report for 1903, pp. 20-36, the following may now be added, to bring the list up to date of 31st December 1904.

Those species which occur wild in, or are domesticated in, Africa and its adjacent islands, including Madagascar, are marked with an asterisk.

Class Mammalia.

ORDERS PRIMATES.

Family Simiidae.

- * *Anthropopithecus troglodytes* (Linnaeus)... Chimpanzee.

Family Cercopitheidae.

- * *Cercopithecus pyrrhonotus*, Hemprich and
Ehrenberg Nias Monkey.

Family Hapalidae.

- Haple jacchus* (Linnaeus) The Marmoset.
" *penicillata* (Geoffroy) Black-eared Marmoset.

ORDER INSECTIVORA.

Family Soricidae.

- * *Crocidura religiosa* (Isidore Geoffroy) ... Sacred Shrew.

ORDER CHIROPTERA.

Family Rhinolophidae.

- * *Rhinolophus euryale*, Blasius Horseshoe Bat.

Family Vespertilionidae.

- * *Pipistrellus rueppelli* (Fischer) Rüppell's Pipistrelle Bat.

ORDER RODENTIA.

Family Sciuridae.

- Sciurus palmarum*, Linnaeus Palm-Squirrel.
 „ *andrewsi*, Boulhote Andrew's Squirrel.

Family Muridae.

- * *Gerbillus shawi* (Lataste) Shaw's Gerbille.
 * *Mus (Arvicanthia) testicularis* (Sundevall) Khartoum Rat.
 * *Nezokia bacheri*, Nehring Egyptian Bandicoot.

Family Leporidae.

- Lepus cuniculus*, Linnaeus var. *dom.* Belgian Hare.
 „ „ „ „ „ Angora Rabbit.

ORDER UNGULATA.

Family Equidae.

- * *Equus burchelli* (Gray) var. *boehmi*, Matschie Böhm's Burchell's Zebra.

Family Bovidae.

- * *Bubalis lehel* (Henglin) Henglin's, or Jackson's Hartbeest.
Tetraceros qua leicornis (Blainville) Four-horned Antelope.
 * *Gazella leptoceros* (Cuvier) Loder's Gazelle.
 * *Gazella ruficollis* (Hamilton Smith) Red-necked Gazelle.

N.B.—No. 107 *Gazella ptilonura* should be removed from the list, the specimen previously provisionally referred to this species, being now considered to belong to *Gazella rufifrons*.

Family Suidae.

- * *Sus scrofa*, Linnaeus, var. *sennarensis* ? Sennar Pig.

Class Aves.

ORDER PASSERES.

Family Ploceidae.

- Estrellda formosa* (Latham) Green Waxbill, or Lovely Finch.
 * *Estrellda melpodu* (Vieillot) Orange-checked Waxbill.
 * *Spermestes cucullata*, Swainson Bronze Mannikin, or Hooded Finch.

- Troglodytes castaneus* (Gould) Chestnut-eared, or Zebra Finch.
Munia ferruginea (Sparman)... .. Java White-headed Finch.
 * „ *cantans* (J. F. Gmelin)... .. African Silver-bill Finch.
 * *Pyromela franciscana* (Lest) Orange Weaver Bird.
 * „ *afra* (J. F. Gmelin)? Napoleon Weaver Bird.
 * *Quelea quelea* (Linnaeus) Red-beaked Weaver Bird.

Family Fringillidae.

- * *Passer rufidorsalis*, Brehm Red-backed Sparrow.
Fringilla montifringilla, Linnaeus? Brambling?
 * *Serinus flaviventris* (Swainson)? Swainson's Canary?

Family Alaudidae.

- * *Melanocorypha calandra* (Linnaeus) Calandra Lark.
 * *Pyrrhuloxia melanocephala* (Cabanis) Black-crowned Finch-Lark.

ORDER PICCAE.

Family Coliidae.

- * *Colinus macrurus* (Linnaeus) Blue-naped Coly.

Family Cuculidae.

- * *Coccyzus glandarius* (Linnaeus) Great Spotted Cuckoo.

ORDER PSITTACI.

Family Psittacidae.

- Conurus aureus* (J. F. Gmelin) Golden-crowned Conure.
Chrysotis inornata, Salvadori Greater Mealy Amazon-Parrot
 „ *amazonica* (Linnaeus) Orange-winged Amazon-Parrot.
 „ *levillanti*, G. R. Gray Levillanti's Amazon-Parrot.
 * *Perocephalus meyeri* (Ruppell)... .. Meyer's Parrot.
Tanganythys sp. incert. Parrot.

ORDER STRIGES.

Family Asionidae.

- * *Bubo cinerascens*, Guérin Grey Eagle-Owl.

ORDER HERODIONES.

Family Ciconiidae.

- * *Ciconia aldimii*, Lichtenstein Aldim Bey's Stork.

Family Plataleidae.

- * *Ibis aethiopica* (Latham) Sacred Ibis.

ORDER ANSERES.

Family Anatidae.

- * *Anas boschas*, Linnaeus, etc. dom. Egyptian Domestic Duck.
 " " " " " " Aylesbury Duck.

ORDER COLUMBE.

Family Columbidae.

- * *Turtur turtur* (Linnaeus) The Turtle Dove.
 " sp. Dove.

ORDER GALLINE.

Family Phasianidae.

- * *Francolinus clappertoni*, Children Clapperton's Francolin.
 * *Pternistes leucoscepus* (Gray) White-shafted Francolin.
 * *Gallus bankiva*, Temminck, etc. dom. Egyptian Double-Crested Fowl.
 " " " " " " Bantam Fowl.

ORDER FULICARIE.

Family Rallidae.

- * *Gallinula chloropus* (Linnaeus) Water, or Moor-hen.

Class Reptilia.

ORDER CHELONIA.

Family Testudinidae.

- Clemmys caspica* (Gmelin) Caspian Terrapin.
Testudo graeca, Linnaeus Greek Tortoise.

ORDER SQUAMATA.

Family Boidae.

- Eryx johni* (Russell) Indian Sand-Boa.

Family Colubridae.

- Coluber leopardinus*, Bonaparte Leopard Snake.

VI. FORAGE.

The following Table shows the nature of food consumed by the animals and its price for each month of 1901.

	January		February		March		April		May		June		July		August		September		October		November		December		TOTAL	
	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.	CE.	MI.
<i>Food.</i>																										
1 Bread ..	2	255			2	270	2	150	2	280	3	192	2	212			2	625	1	652	3	757	3	119	30	922
2 Sugar-cane ..	11	550	12	110	14	260	10	360	12	120		1640							1	208	8	760		600	600	
3 Maize (Green) ..			13	628	11	257	3	613	2	613	13	116	11	610	12	659	12	617	15	663	20	622	28	628	31	1277
4 Green Clover ..	20	655	1	621	1	211	10	310	1	222					1	613	1	662	3	656	1	106	1	254	14	122
5 Dried Clover ..			2	694				661		120		310		350		170		267		267		619		221	22	928
6 Chopped Straw ..	7	163	1	924	1	681	1	661	5	916	8	113	3	263	2	330	3	269	7	613		273	8	162	01	601
7 Wheat ..	1	661	1	597	2	716	2	692	1	178	2	666	2	722	2	307	2	269	2	521		273	2	163	48	220
8 Barley ..	2	172	2	460	2	209	2	912	2	212	2	229	2	312	2	356	2	622	2	512		273	2	163	48	220
9 Maize ..	2	634	2	209	2	615	2	912	2	212	2	229	2	312	2	356	2	622	2	512		273	2	163	48	220
10 Dried-seed ..	2	634	2	209	2	615	2	912	2	212	2	229	2	312	2	356	2	622	2	512		273	2	163	48	220
11 Beans ..	2	634	2	209	2	615	2	912	2	212	2	229	2	312	2	356	2	622	2	512		273	2	163	48	220
12 Beans ..	2	634	2	209	2	615	2	912	2	212	2	229	2	312	2	356	2	622	2	512		273	2	163	48	220
13 Beans ..	2	634	2	209	2	615	2	912	2	212	2	229	2	312	2	356	2	622	2	512		273	2	163	48	220
14 Potatoes ..	3	411	110		1	676	1	676	1	676	1	676	1	676	1	676	1	676	1	676		676	1	676	1	676
15 Potatoes ..	3	411	110		1	676	1	676	1	676	1	676	1	676	1	676	1	676	1	676		676	1	676	1	676
16 Potatoes ..	3	411	110		1	676	1	676	1	676	1	676	1	676	1	676	1	676	1	676		676	1	676	1	676
17 Sugar ..	1	892	4	714	6	840	3	845	2	625	8	518	4	405	3	413	2	518	1	521	1	510	1	515	5	787
18 Tea ..																										16
19 Tea ..																										16
20 Horse-meat ..	11	600	11	625	11	617	11	425	11	642	11	112	11	820	11	610	11	312	11	647	11	600	11	600	11	600
21 Beef ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
22 Mutton ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
23 Potatoes ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
24 Milk ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
25 Milk ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
26 Milk ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
27 Tanned Horse-meat ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
28 Tanned other flesh ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
29 Sausages ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
30 Straw ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
31 Petroleum ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
32 Coal ..	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200	20	200
Total ..	115	200	108	900	93	648	90	561	84	811	27	156	76	288	30	132	76	562	300	100	112	263	116	367	1163	603

Under the above a certain amount of clover, maize and lettuce was grown in the garden and used for feeding the animals.

VII. ACCOUNTS.

Table of Receipts and Expenditure, during 1904.

RECEIPTS.		L.E.	Mill.	EXPENDITURE.		L.E.	Mill.
1. Balance Credit from 1903...	...	...	109	1. Salaries ... ..	...	1,881	243
2. Government Grants:				2. Keepers' clothing ... ..	...	86	052
<i>a.</i> Contribution for 1904 ...	L.E.	1,500.000		3. Feeding, bedding and fuel for animals...	...	1,149	292
<i>b.</i> Giza-Ghezira Gardens ...	"	1,619.000		4. Repairs, upkeep and extension of buildings and cages ... ..	...	520	137
<i>c.</i> Special building (P.W.D.) ..	"	100.000	3,219	5. Purchase and transport of animals...	...	265	961
3. Earned in Gardens:				6. Printing and stationery ... ..	...	34	972
<i>a.</i> Gate Receipts (29.12.03 to 25.12.04, inclusive)...	"	1,373.890		7. Band ... ..	...	54	000
<i>b.</i> Elephant rides... ..	"	3,040		8. Stuns under L.E. 2 (Permanent Advance Account) ... ..	...	161	078
<i>c.</i> Camel rides	"	3,030		9. Library Books ... ..	...	18	890
<i>d.</i> Sales (L.E. 166,939 mill. less L.E. 7,800 mill. refunded) ..	"	159.139	1,539	10. Upkeep of Garden ... ..	...	243	774
4. Fines ... ..	...	...	1	11. Police constables' salaries and clothing...	...	127	836
				12. Telephone Co. and Sewage Co. ... ..	...	6	980
				13. Museum, preparation of specimens for...	...	28	513
				14. Type-writer, purchased ... ..	...	26	200
				15. Expenses of Indian Mahouts ... ..	...	73	929
TOTAL RECEIPTS ...				TOTAL EXPENDITURE ...			
				BALANCE CREDIT ...			
				GRAND TOTAL ...			

VIII. AQUARIUM.

As in 1903, a credit of £E. 120 was allowed by the Tanzim Service, P.W.D., to the Zoological Gardens for looking after the tanks and fish in the Aquarium at Gezira, for the year 1904: but the actual expenditure only came to £E. 65 9/10 mill., as compared to £E. 74 1/91 mill. in 1903.

Twenty-nine species of Nile fish have been exhibited during the year, all of which have done well. It is satisfactory how many of the smaller fish have increased in size, and also how certain fish which formerly spent the whole day in hiding, now swim about so that they can be freely seen by the visitors.

List of Fish, with notes, to supplement those in the report for 1903, pp. 39 to 47.

FAMILY MORMYRIDÆ.

1. *Mormyrops anguilloides*.

Seven specimens caught in the Nile near Emlaka on the 21st August, 1904, were purchased and placed in Tank No. 5: they are of very retiring habits and spend most of the day hidden under the rock-work of the tank, only coming out to feed at dusk. This species had not previously been kept in captivity in this Aquarium, nor as far as known anywhere else.

2. *Marcusenius isidori*.

There are fourteen individuals in Tank No. 11: none of these have been less than ten months, and some have been certainly twenty months and possibly over two years in this tank.

3. *Gnathomenius cyprinoides*.

There are thirteen individuals in Tank No. 21: none of these have been less than ten months, and some have been from twenty months to two years in the tank. This species has the curious habit of sometimes swimming backwards with the tail leading: as was noted of the allied *Mormyrus latipinnis* in the Report for 1903, page 40.

4. *Mormyrus latipinnis*.

The fighting among these fish unfortunately still continues from time to time, and five individuals, apparently killed by their comrades, have been found dead in the tank during the last ten months: one of these was eleven inches in length. There are about twelve individuals now living in Tank No. 16, which have been in captivity for from eleven months to, at most, two years and two months.

FAMILY CUPEDIDÆ.

5. *Cupeda finta*.

The six small individuals in Tank No. 8, which were purchased in May 1903, are all still alive and have noticeably increased in size.

FAMILY CHARACINIDÆ.

6. *Hydrocyon forskali*.

A "Kell- el-Bahr" was purchased on the 5th of June, and placed in Tank No. 3, where it did well till the 14th of December, when it becoming necessary to empty this tank on account of a leak, the fish was transferred to No. 4. Previously no individual of this species had lived longer than four months in the Aquarium, but this specimen has now been over six months in captivity and appears in good condition.

7. *Hydrocyon brevica*.

The specimen purchased on the 10th of November 1902 is still alive in Tank No. 17, and has grown considerably.

8. *Alestes kotzebyi*.

The "Wri" is represented by fourteen or fifteen individuals in Tank No. 18, which were caught in the branch of the Nile running near the Aquarium on the 19th of October 1902.

9. *Alestes aurse*.

The single "Sardecna" caught in the Nile, near the Aquarium, on the 19th of October 1902 is still alive in Tank No. 18; but the specimens in Tank No. 9 were accidentally killed by the tank running dry during the night, 31st of July 1904. On the 9th of August 1904 these were replaced by nine individuals caught at Emlaba, which appear to be doing well in No. 9.

FAMILY CYPRINIDÆ.

10. *Labeo niloticus*.

The specimens now in the Aquarium have been living there for from one year and eight months to two years and four months.

11. *Labeo forskali*.

This carp is well represented in Tanks Nos. 2 and 21: several of the specimens have now been well over two years in the Aquarium, and appear to grow fast, freely eating either bread or meat.

12. *Labeo horie*.

A specimen in Tank No. 24 has now been over two years in captivity: there are numerous smaller individuals in several of the other tanks.

13. *Barbus byuni*.

The specimens in Tank No. 24 were purchased 7th to 13th January 1903.

14. *Barbus periac.*

This small spotted Barbel thrives exceedingly in captivity, and has found its way into many of the tanks.

15. *Barbus miolepis.*

Three specimens, from Alexandria, of this small Barbel were presented by Mr. C. H. Scheller on the 16th of June, 1904; they are in Tank No. 2.

FAMILY SILURIDÆ

16. *Clarias lazera.*

The Eel-like Cat-Fish, or "Armoot," continues to do well; the two specimens caught on the 26th of December, 1901, in Tank No. 23, and the twenty-six specimens purchased in August 1902, in No. 14, are all still alive, and during 1904 two more individuals have been added—a very young one placed in No. 8 on the 14th of March, and one about 26 inches in length caught in the Selamlık Canal of the Zoological Gardens on the 25th of March, this fish was placed in Tank No. 4, but early in October removed itself one night to No. 2, where it now is.

17. *Entropius sp.*

The one specimen in Tank No. 6 has lived there over two years; though formerly very shy, it can now always be seen swimming about the tank in company with the "Schilbe."

18. *Schilbe mystus.*

There are fourteen "Schilbe" in Tank No. 6, where they have lived about two years.

19. *Silurimodon auritus.*

There should be some specimens in Tank No. 6, but they have not been seen for about nine months, the rock-work ornamentation of the tank affording numerous hiding places for fish wishing to do so.

20. *Bayra bayad.*

There are about five specimens of the "Bayad" in Tank No. 4, and one in No. 24, which have been about two years in the Aquarium; they spend nearly the whole of the day-light hours hidden in the crevices of the rock-work, and are therefore seldom seen.

21. *Chrysichthys auratus.*

The curious "Abu Rial" is represented in Tanks Nos. 4 and 18, where apparently it has bred during the year, as in August young specimens were seen in both these tanks; since then they have been visible daily as they no longer spend the day hidden from sight as formerly.

22. *Synodontis schal.*

At least forty-four individuals are living in Tank No. 15, some of these

have now been two and a half years in the Aquarium. The beautiful Albino Schall, which was purchased on the 7th of March, 1904, died on the 10th of April of the same year; a second Albino specimen was purchased on the 14th of March, 1904, and placed in Tank No. 4, but has not been seen since:

23. *Malopterurus electricus*.

The four specimens of the "Abu Raa-Aed," or Electrical Cat-fish, mentioned in the Report for 1903, p. 44, are all still alive and have increased in length and girth during their stay in captivity; the two individuals in Tank No. 22 have the tank all to themselves, the larger is now about fifteen inches in total length; in Tank No. 12, which contains about one cubic metre of water, besides the two *Malopteruri* are kept several "Bolti" *Tilapia nilotica*; neither species of fish appears to in any way interfere with the other.

FAMILY MURAENIDÆ.

24. *Anguilla vulgaris*?

The Eels in Tank No. 1 were placed there during 1902.

FAMILY CYPRINODONTIDÆ.

25. *Haplochilax schoelleri*.

Nine individuals in Tank No. 2, from Alexandria, presented by Mr. C. H. Schoeller (after whom this species was named by Mr. G. A. Boulenger, F. R. S.), 16th of June 1904.

FAMILY SERPENTIDÆ.

26. *Lates niloticus*.

The "Isht," or Great Nile Perch, is represented in the Aquarium by seven specimens, four in Tank No. 20 and one each in Nos. 5, 7 and 24. At least one of these has been in captivity for two years and three months.

FAMILY CICHLIDÆ.

27. *Tilapia nilotica*.

The "Bolti" flourishes in captivity, besides being an ornamental fish, it is also a useful scavenger, eating up any food, animal or vegetable, left in the tanks by other fish. At present there are seven individuals in No. 1 Tank, over fifteen in No. 5, one in No. 11, four in No. 12, and over nine in No. 24.

28. *Paratilapia multicolor*.

Of this small but beautiful fish there are about fifteen specimens from Alexandria, in Tank No. 2, presented by Mr. C. H. Schoeller, 16th of June, 1904.

FAMILY TETRODONTIDÆ

29. *Tetrodon fahaka*.

The Globe Fish in Tank No. 10 has now been over two years and five months in captivity, and has grown very considerably in size during that period.

Of the three smaller specimens in Tank No. 19 (mentioned in the Report for 1904, p. 46), one died on the 15th April 1904 and another on the 24th November 1904, there is little doubt but that they were killed by the survivor. This fish, which was obtained on the 10th of November 1902, has grown rapidly and is now about nine inches in length, and with increased size has become pugnacious, so that now, like the large Globe Fish in Tank No. 10 it will not allow any other fish to share its tank.

The above specimens are fed on pieces of raw meat only; as an experiment to see if a vegetable diet would also suit *Tetrodon fahaka*, a small individual was purchased 16th March 1904, and kept in an observation tank in the Director's office, and fed on meal and grain only; this fish appeared to thrive and was doing very well till unfortunately killed, through a careless accident, on the 27th August 1904. An experiment was also made in another tank in the Director's office on feeding a young *T. fahaka* on Copepoda and small aquatic insects but was inconclusive, the fish dying sixty-five days after it was caught.

These Globe Fish have never yet been seen to inflate themselves in the Aquarium; even when lifted out of the water they make no attempt to do so. The dorsal fin is usually not only depressed but hangs over on one side of the body, the tail fin is nearly always kept closed like a fan, only being spread for an especial effort in swimming, the pectoral fins are usually in a state of rapid vibration.

IX. APPENDIX.

1. The following report on the Grasshoppers, etc., occurring in the Zoological Gardens has been kindly sent by Dr. Franz Werner, of the University of Vienna.

**List of Orthoptera collected or observed in the Giza
Zoological Gardens : July and August 1904.**

1. *Labidura riparia* Pall.—The commonest Ear-wig of Egypt.
2. *Miomantis zavigygi* Sauss. This rare Mantid, originally inhabiting Nubia and Senaar, was also found in the Zoological Gardens in low grass.
3. *Oryzoryphus compressicornis* Latr. Common small Grasshopper.
4. *Epacromia thalassina* Fabr. Common.
5. *Acrotylus patricius* Sturm. Red-winged Grasshopper. Very common and widely distributed throughout Egypt.
6. *Pyrgomorpha grylloides* Latr. Not common.
7. *Chrotogonus lugubris* Blanch. Toad-Locust. This robust small grasshopper jumps about like a small toad, which it resembles also in habit and colour.
8. *Euprepocnemis plarata* Charp. On low bushes, common.
9. *Schistocerca peregrina* L. African Migrating Locust. Collected by the Director in the Gardens in April 1904.
10. *Paratettix meridionalis* Ramb. Small Water-Locust. On moist places, swimming and diving in small ponds.
11. *Gryllus burdigalensis* Latr. Not common.
12. *Gryllotalpa gryllotalpa* L. Common Mole-Cricket. Collected by the Director.

N.B. *Heteropneustia aegyptiaca*, the apterous females of which are sometimes found in the Gardens, and the domestic Cockroaches are not included in the above list. S. S. F.

B. List of Publications of the Zoological Gardens.

Report for the year 1899,	pages 17	Price P.T.5 (one shilling).
.. .. 1900,	.. 20 ... ..	.. P.T.5.
.. .. 1901,	.. 26 ... ..	.. (out of print).
.. .. 1902,	.. 24 ... ..	.. P.T.5.
.. .. 1903,	.. 18 ... ..	.. P.T.5.
Guide book, 1st. Edition, pages 48 and 1 plan. Published 14.12.02.		
		(out of print).
.. 2nd.	.. 66 and 1 ..	Published 18.12.03.
		(out of print).
.. 3rd.	(in preparation).	
Notes for Visitors, Gezira Aquarium. Pages 12. Published Nov. '04.		

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